A

COMPENDIOUS

SYSTEM

OF

PRACTICAL SURVEYING,

AND

DIVIDING OF LAND:

CONCISELY DEFINED,

METHODICALLY ARRANGED,

AND

FULLY EXEMPLIFIED.

THE WHOLE

ADAPTED FOR THE EASY AND REGULAR INSTRUCTION OF YOUTH, IN OUR
AMERICAN SCHOOLS.

COMPILED BY ZACHARIAH JESS.

Second Edition Improved.

954757A

PREFACE.

AS the Treatises heretofore published on survey-
ing, are deficient in examples, whilst they treat large-
ly on the theory; the design of this publication, is, to sup-
ply schools with a system, exemplified with practical il-
lustrations, sufficient to give the learner a competent
knowledge of this useful science.

To avoid swelling the work, and increasing the price, I
have omitted giving a description of the instruments used
in surveying; as they are better understood by inspection,
with a little instruction from the teacher, than by any
description given of them.

I have chosen a short, mechanical method of explaining
and exhibiting to view, the dependencies and proportion-
al properties of triangles, in order to meet the ideas of
the learner, in the most easy and simple manner.—This I
have found to be more useful to them, than any thing I
have before seen.

I have not enlarged on the geometrical method of de-
termining the Area of Maps, as it is not to be depended
on; for although it may appear true, upon demonstrable

principles, I have found by experience, that as many different ways as a map is marked into triangles and trapeziums, so many different areas it will generally give; but I have inserted a sufficient number of examples to show the method, which may answer some purposes: such, as for instance, a man to determine, nearly, the quantity of land in his own fields; and these I have done in perches, and tenths, as coming nearest to the truth——and the larger the scale the better.

The calculations by difference of latitude and departure, are generally made in chains and links, as being more easy and accurate, than in perches, and tenths—nevertheless, for the sake of some variety, and advantage of those who prefer the latter, I have given some examples calculated in perches, and tenths; and it will evidently appear, by inspection, that the numbers to be multiplied, are larger; and as it is customary, in this method, to reject the second decimal figure, it cannot be so accurate—one tenth of a perch square, being equal to $6\frac{1}{4}$ square links.

The method of bringing chains into perches, is very easy: four perches being one chain; therefore, multiply the chains by 4, and the product will be perches, and the contrary.

EXAMPLES.

1. In 37.56 chains, how many perches?

$37.56 \times 4 = 150.24$ perches. The answer.

2. In 150.24 perches, how many chains?

150.24 ÷ 4 = 37.56 chains.   The answer.

Note. These two examples prove each other.

Perhaps some may object to the uniform mode I have adopted, in finding the meridian distances. I know that some use other methods; but I apprehend there is none more easy, than the one I have chosen. And, as I have found by experience, that a variety of methods, to produce the same effect, contribute more to confuse, than instruct the learner, I have adhered to the one general mode.

Z. JESS.

☛ The present edition of this work has been much improved, with additions made by T. HAMILTON of Philadelphia; and the whole carefully examined and corrected by S. HILLES of Wilmington.

THE PUBLISHERS.

1st mo. 1814.

SIGNS USED IN THIS WORK.

°		Degrees,
'		Minutes,
∠		An Angle,
+		More; or, Addition,
×		Multiplication,
=		Equal to,
÷		Division,
—		Less; Subtraction,
△		A Triangle,
S.	Stands for	Sine,
Co-S.		Co-sine,
T.		Tangent,
Co-T.		Co-Tangent,
Sec.		Secant,
Co-sec.		Co-Secant,
.. :: ..		Proportion; as 2 .. 4 :: 3 .. 6
√		Square-Root.

THE

PRINCIPLES

OF

SURVEYING.

SURVEYING.

SURVEYING is the art of delineating and calculating the content of land, in acres, roods and perches, and consists in a knowledge of geometrical definitions and problems.

GEOMETRY.

GEOMETRY is the science wherein we consider the properties of magnitude.

B

GEOMETRICAL DEFINITIONS,

1. A Point is the smallest space that can be assigned, as at A.

2. A Line is the nearest distance between two points, and is considered without breadth or thickness, as A—B.

3. Lines equally distant from each other, in all their parts, are called parallel lines, as AB and CD.

A——B

C——D

4. The inclination, or opening, between two lines, which intersect in a point, is called an Angle, as the opening between the lines AB and AC; the angle is generally represented by three letters, thus BAC, the middle letter being at the angular point, or place of intersection, which is always considered to be the centre of a circle.

B

A C
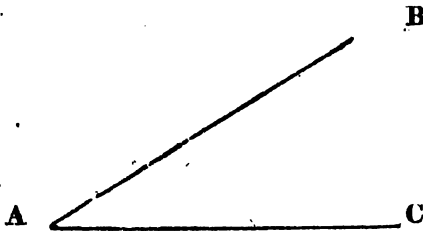
5. When one line stands on another, so as to incline neither way, it is a perpendicular, as the line AC, on the

line DE, and the angles on each side of the perpendicular, are right angles.

A

D———————C———————E
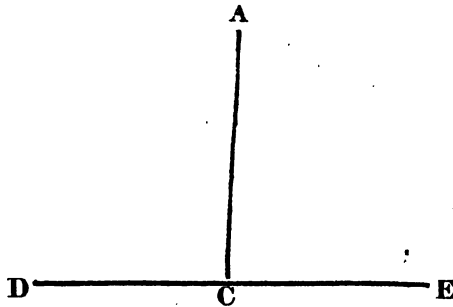
6. A Circle is any distance taken in the compasses, with one point fixed, and the other carried round, and the line described thereby, is called the circumference.

7. The Diameter of a circle is a line which divides it into two equal parts, as AB.

8. The Radius of a circle is the distance taken in the compasses to describe it, and is half the diameter, as AC.

9. A Semicircle is either segment of the circle, made by the diameter, as AGB, or AFB.

10. A Quadrant is half a semicircle, and is contained between half the diameter, and a line perpendicular thereto, drawn from the centre of the circle, as CG.

11. A Chord of a circle is a line which divides the circle into two unequal parts, as DE, and it is a chord to both segments of the circle, as DFE and DGE.
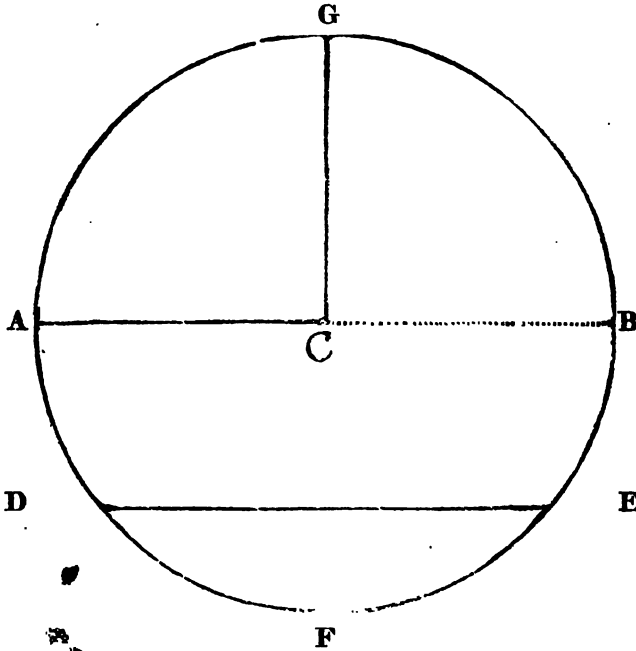
12. A Circle is actually, or supposed to be divided into 360 equal parts, called Degrees, and each degree into 60 equal parts, called Minutes; and these into seconds, &c.

13. An Angle is so many degrees, as lines drawn from the centre of a circle, include those parts of the circle, thus BAC is an angle of 30 degrees ; because the lines, AB and AC, drawn from the centre of the circle, include 30 parts of 360, and it is called an acute angle, because

it is less than 90 degrees, and BAD contains 90 of those
parts, and is therefore an angle of 90°, and is called a
right angle, because AD is perpendicular to AB, and
DAE contains 110 of those parts, and is an angle of 110
degrees, and is called an obtuse angle, because it is greater
than a right angle; consequently CAE must be 130° and
an obtuse angle.

D

B

E

C

A 110°

90°

30°

130°
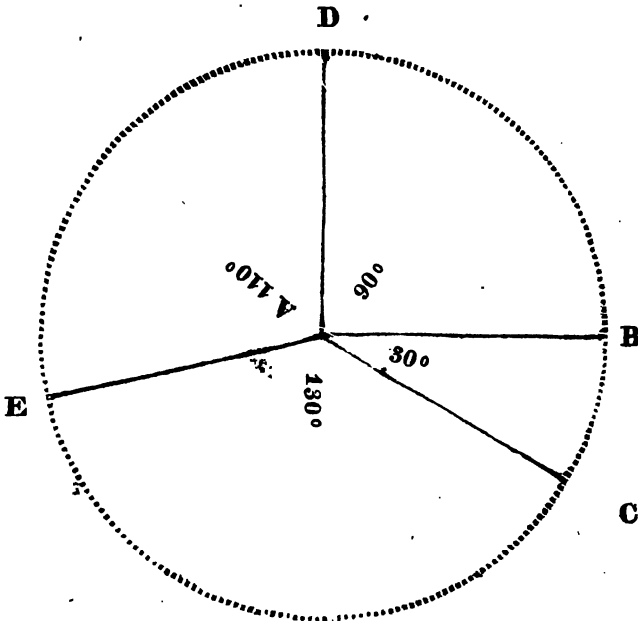
14. A Superfices is a plain, bounded by any number of
lines; but the fewest number which can inclose a superfi-
ces, are three, and it is called a triangle, as ABC, and it
is a right angled triangle, because it has one right angle,

and the side AC opposite the right angle, is called the hypothenuse, and is always the longest; the other two are called the legs; the upright one BC the perpendicular, and the other, AB, the base.

C

A   B
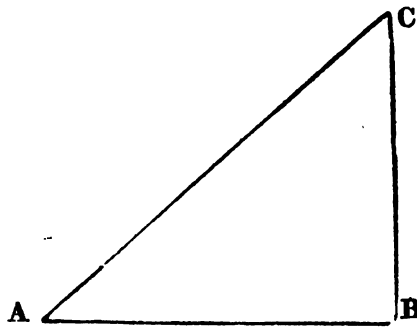
15. All triangles which have not one right angle, are called oblique angled triangles, whether all the angles be acute, as ABC, or one angle obtuse, as DEF.

C

A   B
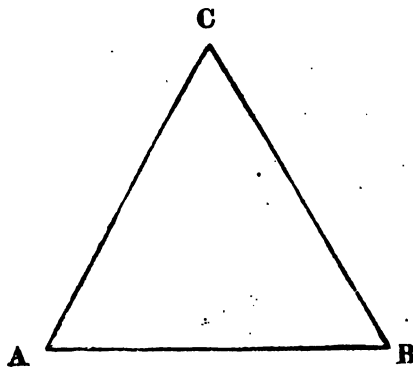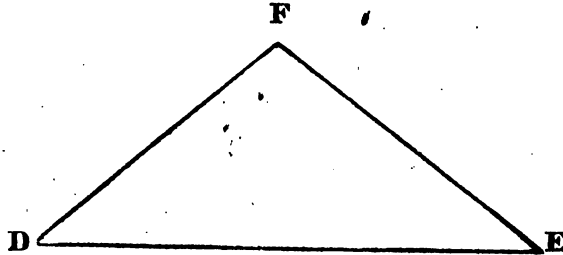
16. Any figure of four sides, is called a quadrilateral figure; and if the opposite sides be parallel, it is called a parallelogram; and if all the sides be equal, and angles right, it is called a square, as ABCD.
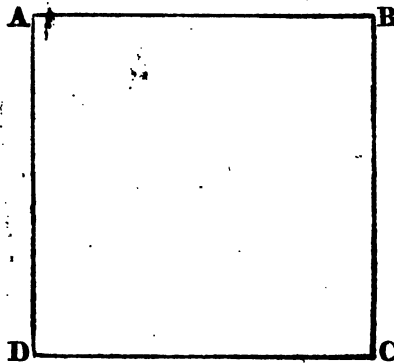
17. A parallelogram, whose opposite sides are equal, and angles right, is called an Oblong, as EFGH.

E ┌─────────────────────────────┐ F
  │   │
  │   │
  │   │
  │   │
  │   │
H └─────────────────────────────┘ G
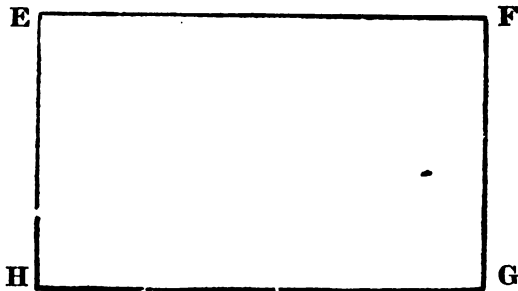
18. A parallelogram of equal sides, and angles oblique, is called a Rhombus, as ABCD, and it is equal to the right angled parallelogram ABEF.

A / B shape with D, F, C, E
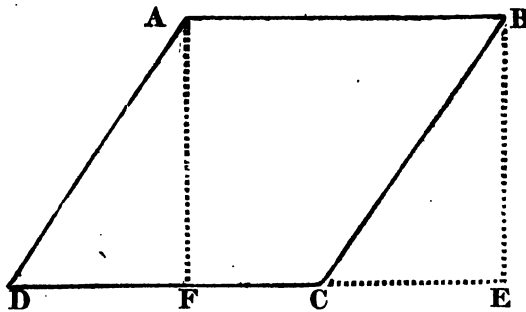
19. A parallelogram whose opposite sides are equal, and angles oblique, is called a Rhomboides, as GHIK, and it is equal to the right angled parallelogram GHLM.

G / H shape with K, M, I, L
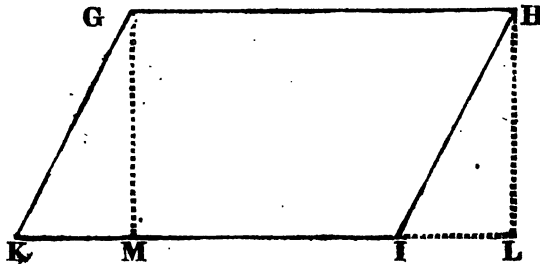
20. Any quadrilateral figure, that is not a parallelogram, is called a Trapezium, as ABCD, and is equal to the two triangles made by the base AC, and perpendiculars De and Bg.
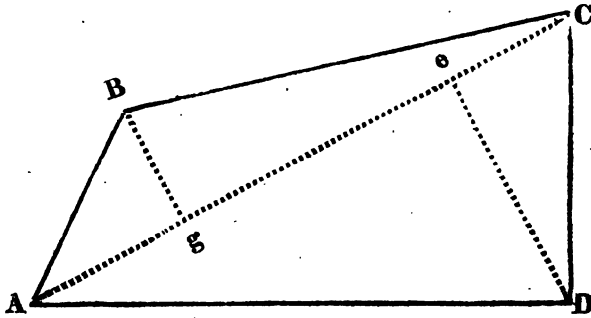
21. The complement of an angle, is what it wants of 90 degrees.

22. The supplement of an angle, is what it wants of 180 degrees.

23. The angles, in every triangle, are equal to two right angles, or 180 degrees.

B

GEOMETRICAL POSITIONS.

1. THE angles in every four sided figure, whether it be right, or oblique angled, are equal to four right angles, as by inspecting the preceding figures may plainly appear.

2. Every triangle is equal to half a right angled parallelogram, made on the base, and with the perpendicular height of the triangle; thus, the triangle ABC, is equal to half the parallelogram ABCD; and the line AC, is a hypothenuse to the two equal right angled triangles, ABC and ADC, and it divides the two right angles, viz. A and C, each into two angles; and if the hypothenuse AC, be bisected in the point E, then each end, viz. AE and CE, will be, in all their similar parts, equidistant from the bases AB and CD, and from the perpendiculars AD and BC, and as by definition 4th. the angular point is always considered to be the centre of a circle; and by definition 13th. an angle is so many degrees as the lines drawn from the centre, contain parts of 360. the degrees in a circle; therefore the angles ACB and CAD, are equal, and also the angles CAB and ACD are equal; it is therefore evidently clear, that if either of these angles be subtracted from 90 degrees, the remainder will be the opposite angle, both on the same, and opposite sides of the hypothenuse; therefore, in every right angled trian-

gle, if one acute angle be given, subtract it from 90 degrees, the remainder will be the other acute angle.

3. The oblique angled triangle DEF, is equal to half the right angled parallelogram DGFH, and each angle is the supplement of two right angles, or 180 degrees; for a semicircle, or half a circle is equal to 180 degrees, and it is evidently clear, by inpsection, that if the inward and outward angles, at each angular point of the triangle, be added together, they will make 180 degrees; therefore, in every oblique angled triangle, the sum of the three angles will be 180 degrees; and if either angle be taken from 180 degrees, the remainder will be the sum of the other two angles; and if the sum of either of the two angles be taken from 180, the remainder will be the other angle: all which will evidently appear by inspecting the following figure.
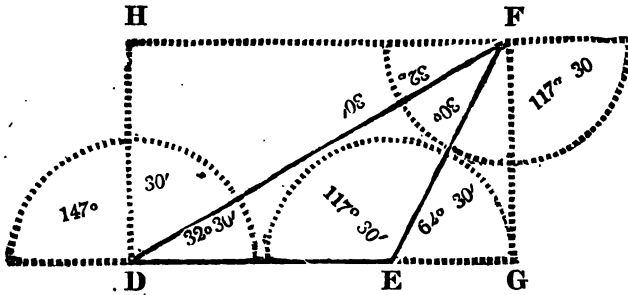
4. If two lines cross each other, the opposite angles will be equal, and the two angles on the same side, will make 180 degrees, which is equal to two right angles.
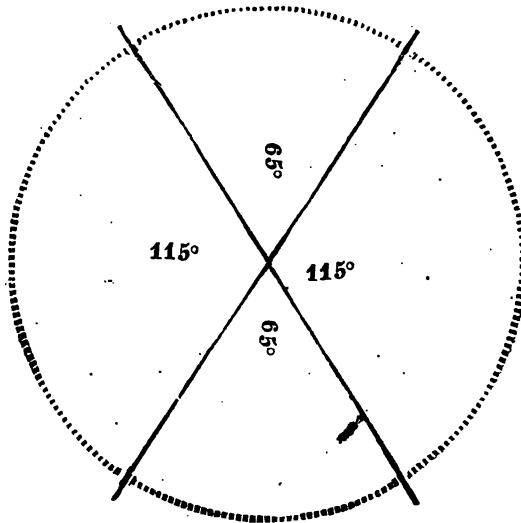
5. All the angles that can be made from any one point, on the same side of a line, are equal to two right angles,

or 180 degrees; and those on both sides of the line, from the same point, will be equal to four right angles, or 360 degrees.

In every triangle, if one side be continued in the same direction, the outward angle will be as much above 90 degrees, as the adjoining inward angle is less than 90 degrees, and equal to both the other inward angles, which will more clearly appear, by inspecting the following figure, and that in position 3d. than by long demonstrations.
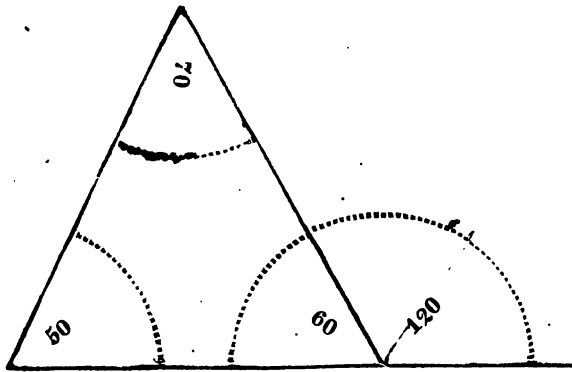
7. In a right angled triangle, if the base and perpendicular be equal, and hypothenuse be bisected at right angles, and the bisecting line continued, it will divide the right angle into two equal angles, each 45 degrees, and the acute angles at A and C, are each 45 degrees, and the four angles make 180 degrees.
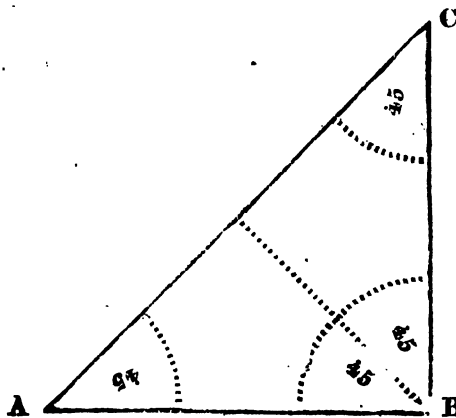
8. In a right angled triangle, as **DEF**, if the perpen-
dicular be longer than the base, and the hypothenuse be
bisected at right angles, the bisecting line will intersect
the perpendicular, so that the upper end (cut off by this
bisecting line) will exactly reach from the place of in-
tersection, as at **G**, to the extreme end of the base, as
to **D**; thus the lines **DG** and **FG**, are equal in length,
and because the base **DE**, and perpendicular **FE**, are un-
equal in length, the acute angles at **D** and **F** are unequal,
and the greatest angle will always be opposite the longest
side.   And as **DG** and **FG** are equal, the angles **GDF**
and **FDG** are equal, by position 7th.
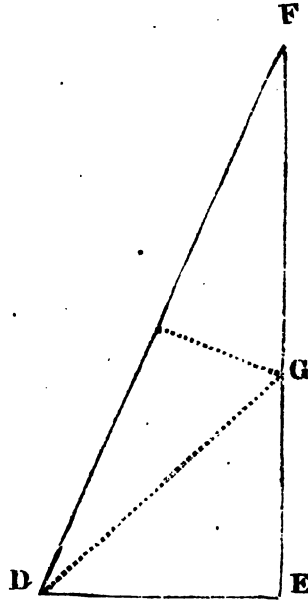
9. In an oblique an-
gled triangle, as ABC,
if all the sides be equal
in length, the angles
will be equal in quan-
tity, and each 60 de-
grees, making in the
whole 180 degrees, as
in the opposite figure.

10. If the sides of a triangle be unequal in length, as
GHI, the angles will be unequal in quantity, and the
greatest angle will be opposite the longest side, and the
least angle opposite the shortest side, as in the following
figure; the three angles taken together, making two right
angles, or 180 degrees.

11. If two sides of a triangle be equal in length, as
sides DE and FE, in the following figure, are equal, then
the angles opposite these equal sides, will be equal, viz.
the angles at D and F, are equal to each other.

GEOMETRICAL PROBLEMS.

PROBLEM I.

TO draw a line parallel to a given line AB, at any distance, as at C.

RULE.

Take, with a pair of compasses, the nearest distance between the point C, and the line AB, and with that distance, and one foot of the compasses in the line AB, as at A, describe an arch, as at D; then from the point C, draw a line to touch the arch at D, and it is done.
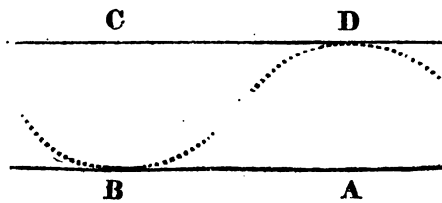
PROBLEM II.

To bisect, or divide a line into two equal parts.

RULE.

With any distance in the compasses, greater than half the given line AB, and one foot of the compasses in A,

D

describe the arch CD ; with the same distance, and one foot in B, cross the former arch in C and D, draw the line CD, and it is done.

C

A————————————————————B

D
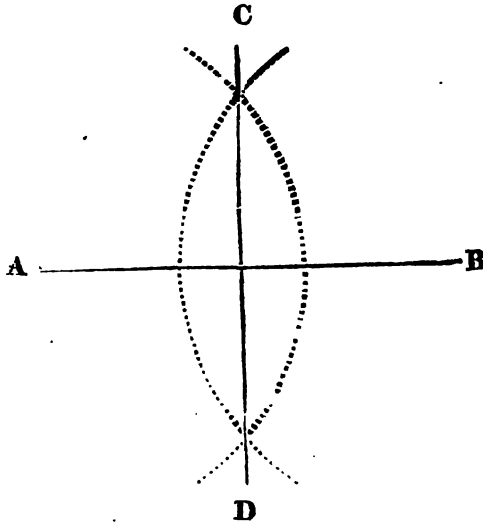
PROBLEM III.

To raise a perpendicular on a given line, as AB, from the point E.

RULE.

With any convenient distance in the compasses, and one foot in E, make a point on each side, as at c and e ; then open the compasses wider, and with one foot in c, describe an arch, as at F ; then with the same extent, and one foot in e, intersect the former arch at F, draw EF, and it is done.

F

A _____ B
e   .E   c
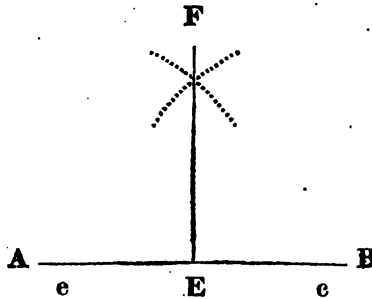
PROBLEM IV.

To erect a perpendicular, on the end of a given line, as AG.

RULE.

With any distance, as from A to C, in the compasses, and one foot in C, describe a circle, so as to touch the end of the given line in A; from where that cuts the given line, and through the centre C, draw a line to cut the circle, as in B; from B, draw the line AB, which will be the perpendicular required.

B

𝒸

A _____ G
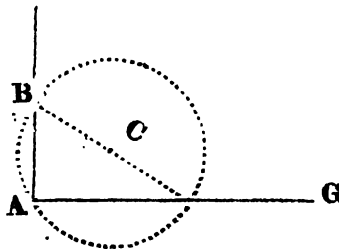
Or, With any convenient distance in the compasses, and one foot in the end of the line, describe an arch as FB, set off the same distance from B to E, with one foot in E, describe an arch at C, and with the same distance, turn one foot over to F, and describe an arch to cut the former in C; from C to A, draw a line, and it is done.
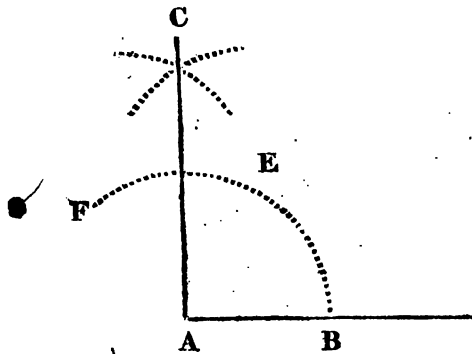
PROBLEM V.

From a point, as at C, to let fall a perpendicular on the line AB.

RULE.

With one foot in C, describe an arch to cut the given line AB; with one foot in each place of intersection, describe arches at D, and from C to D, draw a line, and it is done; for C e is perpendicular to AB, as was required.

C
|

A ————————— e ————— B

D

PROBLEM VI.

From a given point C, to let fall a perpendicular on the end of a given line AB, at B.

RULE.

From any point in the line, as at F, with the distance FC, describe an arch at E; choose any other point in the line, as at D, and with the distance DC, intersect the former arch in E; join CE, and it is done as required.
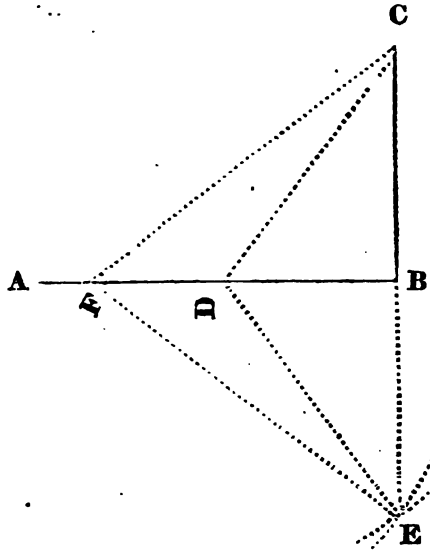
PROBLEM VII.

To make a right angle at B, on the line BA.

RULE.

Erect the perpendicular BC, and it is done.

Or, On the point B, and with the chord of 60 degrees in the compasses, describe an arch, on which set off 90 degrees from the line BA to C; then draw BC, and it is done.

C

90°

B   A
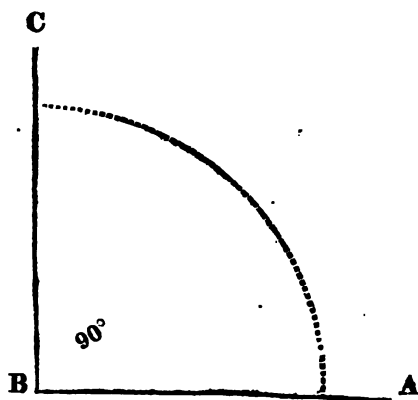
PROBLEM VIII.

To make an angle equal to any number of degrees, suppose 42° 30′.

RULE.

With the chord of 60 degrees in the compasses, on A describe an arch from the line AB, and from that line lay 42° 30′ on the arch to D; then through the point D, draw AC, and it is done.

C

D

42° 30′

A   B
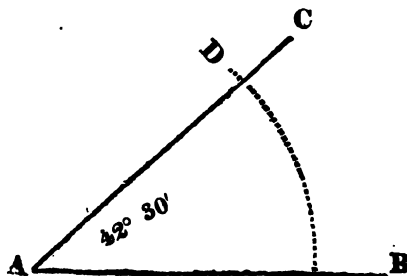
Note. To measure an angle, take the chord of 60° in the compasses, and
with one foot in the angular point, make an arch from line to line;
then take the arch in the compasses, apply it to the chord, which
will shew the degrees; thus the preceding angle will measure 42° 30'.

PROBLEM IX.

To make an obtuse angle, equal to 102° 20'.

RULE.

With the chord of 60 degrees in the compasses, on B
describe an arch, on which from C, set off 60 degrees to
G, and from G, 42° 20' to D; draw BD, and it is done.
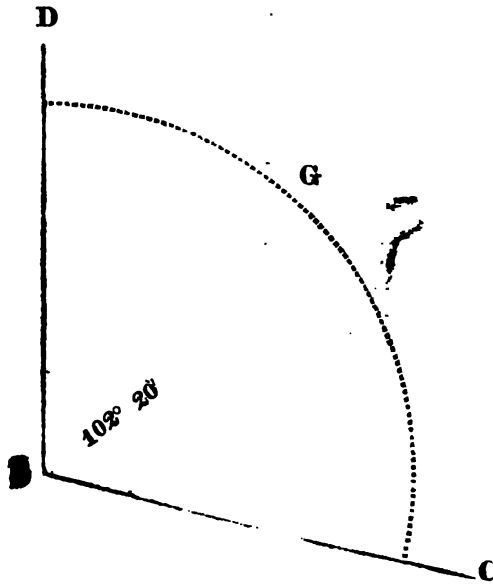
PROBLEM X.

The angles and hypothenuse given, to find the legs.

EXAMPLE.

The hypothenuse 121 perches, the angle opposite the base 54° 30′; consequently the other angle 35° 30′ by position 2d. page 10; the base and perpendicular are required.

RULE.

Draw the line CB, and on C, by Problem 8, make an angle equal to 35° 30′, draw CA; take 121 perches in the compasses, from a scale of equal parts, and set it from C to A; then (by Problem 5) from A let fall the perpendicular AB; then the perpendicular AB, being taken in the compasses, and measured on the same scale, will be 70.25 perches, and the base CB, 98.5 perches, as required.
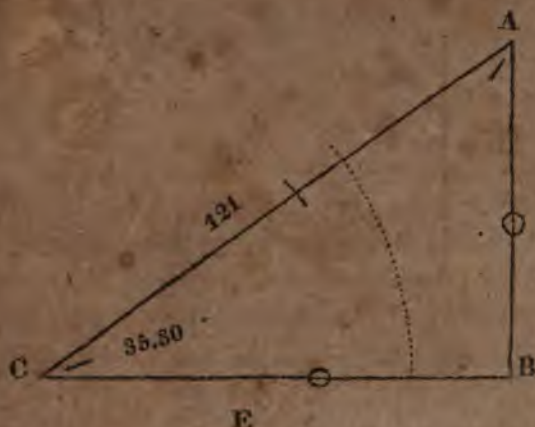
PROBLEM XI.

The angles, and one leg given, to find the hypothenuse, and the other leg.

EXAMPLE.

The angle opposite the perpendicular 33° 15'; the base 274 perches, to find the hypothenuse, and perpendicular.

RULE.

Draw CB, equal to 274 perches, from a scale of equal parts; upon B, erect a perpendicular, by Problem 3; and on C, make an angle equal to 33° 15' by Problem 8; draw CA, and where it intersects the perpendicular, will be its length; then the hypothenuse CA, measured on the same scale, will be 327.6, and the perpendicular BC, 179.6 perches.

James M Feak,s Boo k

33 15

274

C   B

A
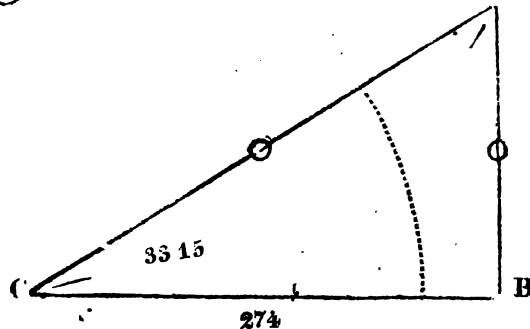
James M Leake

PROBLEM XII.

The hypothenuse, and one leg given, to find the angles, and the other leg.

EXAMPLE.

The perpendicular 69 chains, hypothenuse 150 chains; the base and angles are required.

RULE.

Draw the base, and on B erect a perpendicular to A, equal to 69, from a scale of equal parts; from the same scale, take 150 in the compasses, and with one foot in A, let the other fall on the base, as at C; then the base, taken in the compasses, and applied to the same scale, will be 133, and the angle ACB, measured on the chord of 60 degrees, (by the note to Problem 8) will be 27° 23′; consequently the other angle 62° 37′, by position 2, page 10.

PROBLEM XIII.

The legs given, to find the angles and hypothenuse.

EXAMPLE.

The perpendicular 980 perches, the base 690 perches; the angles and hypothenuse are required.

RULE.

. Draw the base equal to 690, and the perpendicular equal to 980 perches, from a scale of equal parts; then from the extremities of the base and perpendicular, draw .the hypothenuse AC, which being measured on the same scale, will be 1198 perches,* and the angle at C, measured on a chord of 60°, (by note to Problem 8) will be 54° 51'; the other angle 35° 9', by the position 2d.
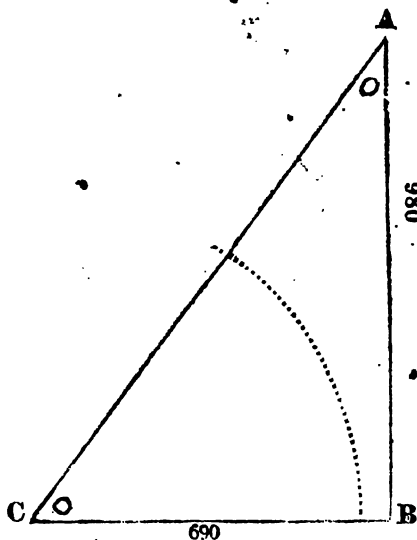
* *Note.* Two sides of a right angled triangle being given, the third may be found by the square root in arithmetic, or extracted by the logarithms as here:

The sum of the squares of the base and perpendicular, is equal to the square of the hypothenuse; and the difference between the squares of the base and hypothenuse, is the square of the perpendicular: and that between the perpendicular and hypothenuse, is the square of the base : thus, in the preceding example, the square of 690, the base is 476100; and the square of 980, the perpendicular is 960400: their sum is 1436500, the square of the hypothenuse, the square root of which is 1198, the length of the hypothenuse of the same measure that the base and perpendicular are.

Again: If from 1436500, the squre of the hypothenuse, be taken 476100, the square of the base, there remains 960400, the square of the perpendicular, its square root is 980, the length of the perpendicular; and from the square of the hypothenuse, take the square of the perpendicular, the remainder is 476100, its square root is 690, the length of the base, which is exemplified in the following example, where the base is 6, perpendicular 8, and hypothenuse 10.
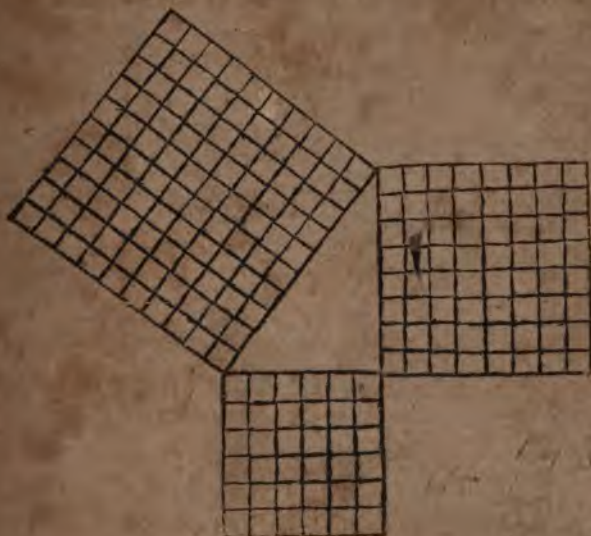
PROBLEM XIV.

The angles, and one side of an oblique angled triangle given, to find the other sides.

EXAMPLE.

The angle BDC 101° 25', CBD 44° 42'; consequently the other angle 33° 50' (by position 3, p   t) and the leg BC 76 perches, to find the sides CD   D.

RULE.

Draw BC equal to 76 perches; on B make an angle equal to 44° 42', and on C an angle equal to 33° 53': the place of intersection will determine the point D; then BD being measured on the same scale, will be 43.2, and DC 54.5 perches, as required.
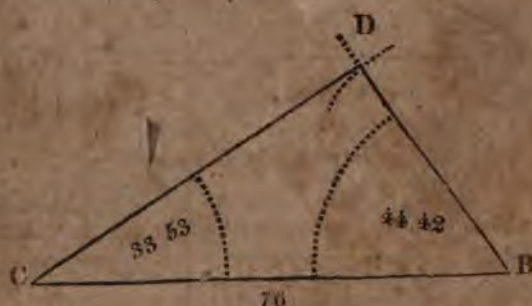
PROBLEM XV.

Two sides, and an angle opposite to one of them given, to find the other opposite angle, and third side.

EXAMPLE.

The side BC 106 chains, BD 65 chains, and the angle at C 31° 49', to find the angle at D, and side CD.

RULE.

Draw the line BC, equal to 106 chains, from a scale of equal parts; make an angle on C, equal to 31° 49'; take 65 chains in the compasses, and with one foot in B, lay the other on the line CD in D; then the angle B, being measured on the chord of 60 degrees, will be 27° 28', consequently the other angle 120° 43' (by position 3, page 11) and the side DC 56.9 chains, on the scale of equal parts.
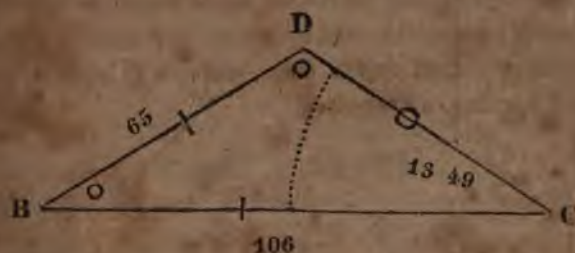
PROBLEM XVI.

Two sides, and their contained angle given, to find the other angles, and third side.

EXAMPLE.

The side BC 109, BD 76, and angle CBD 101° 50' given, to find the other angles, and side CD.

RULE.

Draw the line CB, equal to 109 chains or perches; BD 76, from a scale of equal parts, making an angle on B, equal to 101° 30'; join DC, and apply it to the same scale of equal parts, and it will be 144.8, and the angle at D, measured on a chord of 60 degrees, will be 47° 32', and the angle on C, 30° 58', as required.
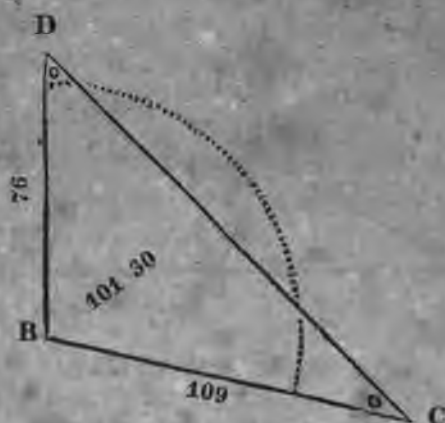
PROBLEM XVII.

The three sides given, to find the angles.

EXAMPLE.

The sides BC 105, BD 85, and CD 50 chains or perches, to find the angles at B, C and D.

RULE.

Draw the line BC, equal to 105, from a scale of equal parts; take CD, 50 in the compasses, and with one foot on C, describe an arch at D; then take BD, 85, in the compasses, and with one foot on B, intersect the arch at D, join BD and CD; then the angle at B, being measured on a chord of 60 degrees, will be 28° 4′, and at C 53° 7′; consequently the angle at D, 98° 49′, by position 3.
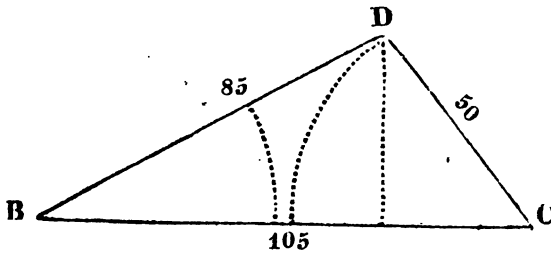
PROBLEM XVIII.

To describe a circle about a triangle ABC, or through any three points not in a direct line.

RULE.

Bisect any two of the triangle's sides, at right angles, and where the bisecting lines intersect, is the centre of the circle, as at D, the distance from which, to one point of the triangle, and carried round, will be the circle required.

F
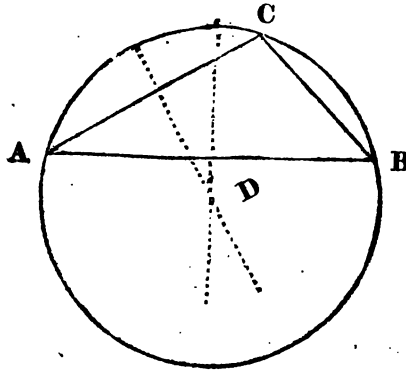
PROBLEM XIX.

To find the centre of a circle.

RULE.

With any radius, and one foot in the circle, as at A, describe an arch, as CBD; then with the same radius, and where the arch cuts the circle, describe another arch, as CAD, and through the points of intersection, draw the line CDG; in like manner draw another line as EFG, which will intersect the other line in the centre of the circle; for each of these lines, if continued, will be a diameter to the circle.
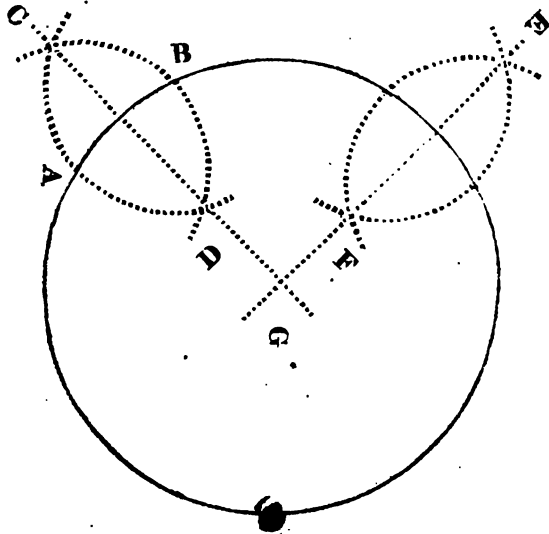
PROBLEM XX.

To make a right angled parallelogram, whether a square, or an oblong.

EXAMPLE.

The sides AB and CD, each 7 chains 20 links; the perpendiculars AC and BD, each 5 chains 40 links.

RULE.

Draw AB equal to 7.2 chains, from a scale of equal parts; on B erect a perpendicular equal to 5.4 chains; then with AB in the compasses, and one foot on D, de-

scribe an arch at C, and with BD in the compasses, with
one foot on A, intersect the former arch at C ; join CA
and CD, and it is done.

C   7.20 chains.   D

5.40 chains.   5.40 chains.

A   7.20 chains.   B
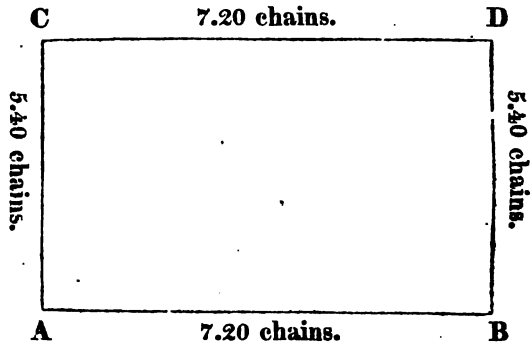
PROBLEM XXI.

To make a Rhombus.

EXAMPLE.

Let each side of the Rhombus be 6 chains, 35 links,
and perpendicular height 5 chains, 80 links.

RULE.

Draw AB and CD parallel, at the distance of 5 chains,
30 links; then take 6.35 chains in the compasses, lay it
from C to D, with one foot in D ; let the other fall in the
line AB at B; turn over to A, join the several corners
by lines, as in the figure, and it is done.

6.35 ch.

C   D

6.35 ch.

6.35 ch.

5.80 ch.

A   6.35 ch.   B
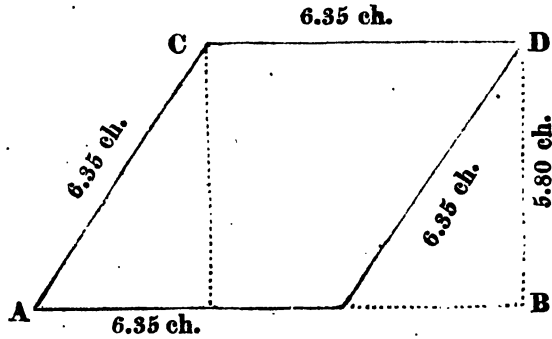
PROBLEM XXII.

To make a Rhomboides.

EXAMPLE.

Let the lines AB and CD, be each 7 chains, 64 links ; AC and BD, each 5 chains, 25 links ; perpendicular height 4.85 chains.

RULE.

Draw AB and CD, parallel, at the distance of 4.85 chains ; take 7.64 chains in the compasses, and set it from C to D ; take 5.25 chains in the compasses, and lay it from D to B ; make BA equal to CD ; join the several corners by lines, as in the figure, and it is done.

C 7.64 ch. D

5.25 ch.

5.25 ch.

4.85 ch.

A 7.64 ch. B B
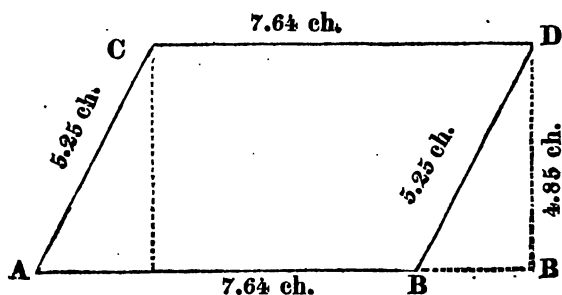
PROBLEM XXIII.

To make a Trapezium.

EXAMPLE.

Let ABCD be the boundary lines; the base AC 64.4 perches; the perpendicular Bb 13.6, and Dd 27.2 perches; the first perpendicular from A 18 perches, the 2d from C 14 perches.

RULE.

Draw AC equal to 64.4 perches: then 18 perches from A, raise a perpendicular equal to 13.6 perches; and 14 perches from C, raise a perpendicular equal to 27.2 perches, on the opposite side of the base AC; join the several boundary lines, as in the figure, and it is done.
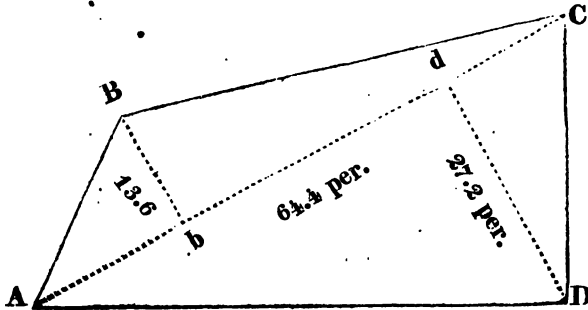
PROBLEM XXIV.

To divide a given line, as AB, into any number of
equal parts, suppose 7.

RULE.

From the point A, draw the line AC, making any an-
gle with the line AB, and from the point B, draw BD,
parallel to AC; then with any convenient distance in the
compasses, on the lines AC and BD, and from the angu-
lar points, turn over on each as many times, less one,
than the divisions; join the several points, and the line
is divided as proposed.
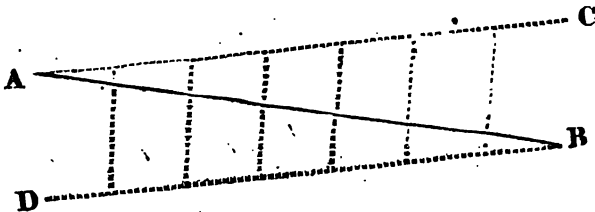
PROJECTION

OF THE LINES OF
SINES, TANGENTS, AND SECANTS,

ON THE PLANE SCALE.

1. WITH any convenient radius, describe a semicircle ADBC, and upon the centre C, raise the perpendicular CD, which will divide the semicircle into two quadrants AD, BD; continue CD to S: and upon B raise the perpendicular BT; then draw the lines BD and AD.

2. Divide the quadrant BD, into 9 equal parts; then will each of these be 10 degrees, which may be subdivided into single degrees and minutes, if the radius be large enough to admit.

3. Set one foot of the compasses in B, and transfer each of the divisions in the quadrant BD, to the right line BD; then is BD a line of chords.

4. From the points 10, 20, 30, &c. in the quadrant BD, draw lines parallel to CD, till they cut the radius CB; then is the line CB, divided into a line of Sines.

5. From the centre C, through the several divisions of the quadrant BD, draw lines till they cut the tangent BT; so will the line BT become a line of tangents.

6. Set one foot of the compasses in C, extend the other to the several divisions 10, 20, 30, &c. in the tangent line BT, and transfer these extents, severally, into the lines CS; then will the line CS be a line of secants.

7. Right lines drawn from A to the several divisions 10, 20, 30, &c. in the quadrant BD, will divide the radius CD into a line of sines.

8. Divide the quadrant AD, into 9 equal parts; and from A transfer these divisions, severally, into the line AD; then is AD a line of chords.

G
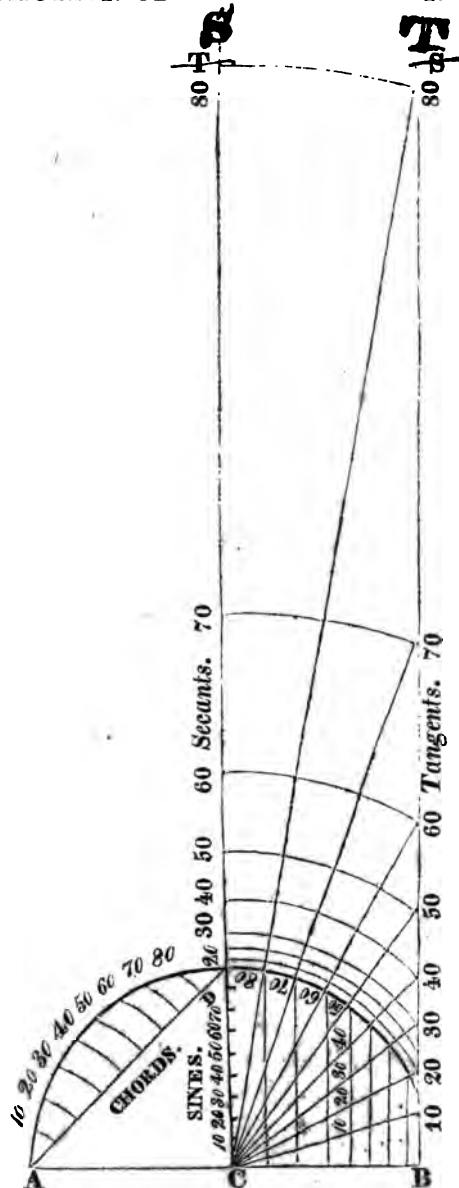
GUNTER'S SCALE.

WHILE the reader is perusing the following, it will be proper to have a Gunter's Scale before him.

Gunter's Scale has on it these several lines, viz.

1. Sine Rhumbs, marked S. R. is a line which contains the logarithms of the natural sine of every point and quarter point of the Mariner's Compass, figured from the left hand toward the right, with 1, 2, 3, 4, 5, 6, 7, to 8, where is a brass pin; and, where it can be done, these are divided into halves and quarters.

2. Tangent Rhumbs, marked T. R. also corresponds to the logarithm of the tangent to every degree of the said compass, and is figured 1, 2, 3, 4, at the centre, where there is a pin; and from thence, toward the left hand, with 5, 6, 7: it is also divided, where it can be done, into halves and quarters.

3. The Line of Numbers, marked *Num.* contains the logarithms of the numbers, and is figured thus: near the left hand it begins at 1, and towards the right hand is 2, 3, 4, 5, 6, 7, 8, 9; and then 1 is the middle, at which

is a brass centre pin, going still on 2, 3, 4, 5, 6, 7, 8, 9, and 10 at the end, where there is another centre pin; the first one may be counted for 1, or 10, or 100, or 1000; and then the next 2 is accordingly 2, or 20, or 200, or 2000, &c.

Again; the first 1 may be reckoned 1 tenth, or 1 hundredth, or 1 thousandth part, &c. then the next 2 is 2 tenths, or 2 hundredths, or 2 thousandth parts, &c. so that if the first 1 be esteemed 1, the middle 1 is then 10, and 2 to its right is 20; 3 is 30; 4 is 40; and 10 at the end is 100.

Again; if the first one be 10, the next 2 is 20; 3 is 30, and so on, making the middle 1 now 100; the next 2 is 200; 3 is 300; 4 is 400, &c. and 10 at the end is now 1000. In like manner, if the first 1 be esteemed 1 tenth part, the next 2 is 2 tenth parts; and the middle 1 is 1, and the next 2 is 2, and 10 at the end is now 10.

Again; if the first 1 be counted 1 hundreth part, the next 2 is 2 hundredth parts; the middle 1 is now 10 hundredth parts, or one tenth part; and the next 2 is 2 tenth parts; and 10 at the end is now but one whole number, or integer.

As the figures are increased or diminished in their value, so in like manner must all the intermediate strokes or subdivisions be increased or diminished; that is, if the first 1 be counted 1, then 2 on the right of it is 2, and each subdivision between them now is one tenth part, and so all the way to the middle 1, which now is 10, the

next 2 is 20; now the longer strokes between one and 2 are to be counted thus, 11, 12, where is a brass pin; then 13, 14, 15; sometimes a longer stroke than the rest, 16, 17, 18, 19, 20, at the figure 2; and all the shorter strokes between the longer, are now each to be counted two tenth parts from the middle 1 to the next 2, now 20; from whence the longer strokes between the figures are units, thus, 21, 22, 23, &c. to 3, which now is 30, and the shorter strokes each between them, now is one tenth part of an integer; from 3, each short stroke or division, is one tenth part of an unit.

Again; if 1 at the left hand be 10, the figures between it and the middle 1 are common tens; and the subdivisions between each figure are units: from the middle 1 to 10 at the end, each figure is so many hundredths; and between these figures, each longer division is 10; from the middle 1 to 2, each less division is 2 units; and from 2 to the end, each shorter division is 5 units.

From this description, it will be easy to find the divisions representing any given number, thus: suppose the point representing 12 is required? Take the division at the figure 1, in the middle for the first figure of 12; then for the second figure, count 2 tenths, or longer strokes, to the right hand, and this last is the point representing 12, where is a brass pin.

Again; suppose the number 22 is required? The first figure being 2, take the division to the figure 2, and for the second figure 2, count 2 tenths onwards, and that is the point representing 22.

Again; suppose 1728 is required? For the figure 1, take the middle 1 ; for the second figure 7, count onwards as before, and that is 1700 ; then for the third figure 2, count 2 tenths from the last, and it represents 1720 ; lastly, for the fourth figure 8, estimate 8 parts out of 10 of the next smaller division, this point represents 1728.

Required the point representing the number 435 ? From 4 in the second interval, count towards 5 on the right hand, three of the large divisions, and one of the smaller, and that will be the division expressing 435, and the like of other numbers.

All fractions in this line must be decimals ; and if they be not, they must be reduced into decimals, which is easily done by extending the compasses from the denominator to the numerator ; that extent will reach from 1 in the middle to the decimal required.

EXAMPLE.

Required the decimal fraction equal to $\frac{3}{4}$?

Extend from 4 to 3 ; that extent will reach from 1 in the middle to 75, = .75, the decimal required, towards the left hand ; and so of any other vulgar fraction.

MULTIPLICATION,

Is performed on this line, by extending from 1 to the multiplier ; that extent will reach from the multiplicand to the product.

Suppose it is required to multiply 16 by 4?

Extend from 1 to 4; that extent will reach from 16 to 64, the product.

DIVISION,

Being the reverse of Multiplication; therefore extend from the divisor to 1; that extent will reach from the dividend to the quotient.

Required to divide 64 by 4?

Extend from 4 to 1; that extent will reach from 64 to 16, the quotient.

PROPORTION, OR THE RULE OF THREE,

Being performed by Multiplication and Division, therefore extend from the first term to the third; that extent will reach from the second to the fourth.

EXAMPLE.

If the diameter of a circle be 7 inches, and the circumference 22; what is the circumference of another circle, the diameter of which is 14 inches?

Extend from 7 to 14; that extent will reach from 22 to 44, the circumference required.

In like manner, may any other proportion be worked.

To find the superficial content of a board, plank, &c.

Extend from 1 to the breadth; that extent will reach from the length to the superficial content.

EXAMPLE.

Suppose a board or plank 15 inches broad, and 27 feet long; required the content?

Extend from 1 to 1 foot 3 inches; that extent will reach from 27 feet to 33.75 feet, the superficial content.

Or, Extend from 12 inches to 15 inches, &c.

The solid content is found by extending from 1 to the breadth; that extent will reach from 1 to a 4th number; and from 1 to that 4th number, will reach from the length to the solid content.

EXAMPLE I.

What is the content of a square pillar, 21 feet 9 inches long, 1 foot 3 inches broad on each side?

The extent from 1 to 1.25, will reach from 1.25 to 1,56, the content of 1 foot long. Again; the extent

from 1 to 1.56, will reach from the length 21.75 to 33.98, or 34 feet solid.

EXAMPLE II.

Suppose a piece of timber 1.25 feet broad, .56 feet deep, and 36 feet long; required the content.

Extend from 1 to 1.25, that extent will reach from .56 to .7; then extend from 1 to .7, that extent will reach from 36 to 25.2 feet, the solid content.

The line of Sines, marked *Sin.* begins at the left hand, and is figured thus: 1, 2, 3, 4, 5, &c. to 10; then 20, 30, 40, &c. to 90, ending at the right hand, where is a brass pin, here, and in all lines under it: these figures are called Degrees.

The line of versed sines, marked V. S. begins at the right hand, against 90° on the sines, and from thence figured towards the left hand, thus: 10, 20, 30, 40, &c. ending at the left hand, about 169°; each of the subdivisions, from 10 to 30, are 2 degrees, and from thence to 90, it is single degrees; and from thence to the end, each degree is divided into 15 minutes.

The line of Tangents, marked *Tan.* begins at the left hand, and figured to the right, thus: 1, 2, 3, &c. to 10, and so on to 20, 30, 40, and 45, where is a brass pin, just

H

under and even with 90, in the line of sines ; from thence
back, it is figured 50, 60, 70, 80, &c. to 89, ending at
the left hand.   Where it began, at one degree, the sub-
divisions are as the sines.

The line of Meridional Parts, marked *Mer.* begins at
the right hand, and numbered 10, 20, 30, to the left
hand, where it ends at 87 degrees.   This line, with the
line of equal parts, marked E. P. under it, are used to-
gether, and only in Mercator's sailing.   The upper line
contains the degrees of the meridian, or latitude, in Mer-
cator's chart ; and the lower, the equator, and contains
the degrees of longitude.

OF

LOGARITHMS.

LOGARITHMS are a series of numbers, by which
the work of multiplication may be performed by addi-
tion, and division may be done by subtraction; for, if the
logarithm of any two numbers be added together, the
sum will be the logarithm of the product: and if the lo-
garithm of the divisor be subtracted from the logarithm
of the dividend, the remainder will be the logarithm of
·the quotient: and if the logarithm of any number be di-
vided by 2, the quotient will be the logarithm of the
square root of that number. And if the logarithm of any
number be divided by 3, the quotient will be the loga-
rithm of the cube-root of that number.

To find the logarithm of any number less than 5 figures.

EXAMPLES.

To find the logarithm of 7.

Look in the table for the number 7, in the side co-
lumn, and against it is .84510: this number being but
one figure, the index to the logarithm is 0.

To find the logarithm of 79.

Look in the table for the number 79, in the side column, and against it is .89763 ; 1 being the index, because the given number has two figures.

To find the logarithm of 763.

Look for 763 as before, against which is .88252, the index being 2, because the given number has three figures.

To find the logarithm of 7634.

Find the three first figures, viz. 763, in the side column as before, and the fourth figure 4, at the top of the page ; then opposite 763, and under 4 is .88275, to which prefix the index 3, because the given number has four figures.

To find the logarithm of five figures, or more.

Suppose 76345.

Find the logarithm of the four first figures, as before, which will be 88275 ; take the difference between this logarithm, and the next greater, which is 6 ; then say, if 10 give 6, what will the remaining figure, viz. 5, give ? thus, If 10 . . 6 : : 5 . . 3, the fourth number is 3, which, added to the former logarithm 88275, gives 88278, to which prefix the index 4, because there are five figures, and it gives the logarithm of 76345, viz. 4.88278.

To find the logarithm of 763458.

Find the logarithm of the four first figures, as before, viz. 88275.

Take the difference, as before ; then say, if 100 gives 6, what will the remaining figures, viz. 58 give? Answer 3 ; which added to 88275, makes 88278, to which prefix the index 5, and it gives the logarithm of 763458 to be 5.88278.

Note. The Index figure is always one less than the number of figures in the given whole number, whether a decimal be annexed or not.

To find the logarithm of 763.458.

Find the logarithm, as before, the same as if the figures were all whole numbers ; then, because there are but three figures in the integers, prefix the index 2, and it gives 2.88278 ; for the logarithm of 763.458, the same as in the preceding example, only in the index.

To find the number answering to any logarithm of four places of figures.

What is the number to the logarithm 3.77342 ?

Look in the column under 0, and there the next less logarithm will be 7705, opposite to 593 in the side column, then look directly across the page, and the exact logarithm will be found under 5 at the top, which annex to 593, makes 5935, the number required.

Note. When the exact logarithm is not found, it is usual to take the next less, or nearest, which is exact enough in common business

To find the number answering to a logarithm of 5, or more places of figures.

What number answers to the logarithm 4.59632 ?

Take the difference between the next less logarithm, and the given one ; also the difference between the next less and greater logarithms ; then say, as the difference between the next less and greater logarithm, is to the difference between the numbers answering thereto, (with a cypher annexed for every unit the index figure is more than 3) so is the difference between the next less and given logarithm, to the correction sought, which added to the number answering to the next less logarithm, gives the number required.   What is the number answering to the following logarithm?

4.59632 given log.
4.59627 The nearest less log. is 59627 its num. =39470
         The next greater do. is 59638 =   39480
_____
  5   Difference.   11   10

As 11 . . 10 : : 5 . . 4$\frac{6}{11}$, which call 4.6; and added to 39470, makes 39474.6 the number sought.

MULTIPLICATION BY LOGARITHMS.

RULE.

To the logarithm of the multiplicand, add the logarithm of the multiplier; the sum is the logarithm of the product.

CASE 1.

To find the product of two whole or mixed numbers.

Multiply	76, log.	= 1.88081
By	54,	= 1.73239
Product 4104		= 3.61320

Multiply	76.4 log.	= 1.88309
By	5.4	= 0.73239
Product 412.56 ·		= 2.61548

CASE 2.

When both or either of the factors are less than unity.

RULE.

When the figure next to the decimal point is part of an unit, the index is 9; but if it be 0, the index must be 8; and as many cyphers as are annexed to the point, so many units the index must be less than 9; so that the number of cyphers annexed to the decimal point, and index figure, taken together, must make 9; and in adding these logarithms, ten must be rejected, if the index figures amount to ten.

Multiply   3.72 log. = 0.57054
By   .00064   = 6.80618

Product .0023808   = 7.37672

, Multiply   59.4 log. = 1.77379
By   .000031   = 5.49136

Product .0018414   = 7.26515

DIVISION BY LOGARITHMS.

RULE.

From the logarithm of the dividend, take the logarithm of the divisor, the remainder is the logarithm of the quotient.

In fractions, observe the same rule as given in multiplication; and when the Index figure of the divisor is greater than that of the dividend, 10 must be borrowed, as it was rejected in addition.

Divide 4104 log. = 3.61321
By   54   = 1.73239

Quotient 76 log. = 1.88082

Divide 410.4 log. = 2.61321
By   5.4   = 0.73239

Quotient 76.0   = 1.88082

Divide .008215 log. = 7.91461
By .031 = 8.49136
___
Quotient .265 = 9.42325
___

Divide .0023808 log. = 7.37672
By 3.72 = 0.57054.
___
Quotient .00064 log. = 6.80618
___

Divide 59.45 log. = 1.77415
By .0000315 = 5.49209
___
Quotient .0001915 = 6.28206
___

Note. In the indices here, I borrowed 10, in the same manner as it was rejected in Addition. (See Multiplication.)

To extract the Roots by Logarithms.

The logarithm of the given number, divided by 2, quotes the logarithm of the square-root of that number, and divided by 3, quotes the logarithm of the cube-root of that number.

EXAMPLES.

What is the square-root of 324?

Log. of 324, is = 2)2.51054
___
Root is 18, its log. is = 1.25527

I

What is the cube-root of 10648 ?

$$10648 \text{ log. } = 3)4.02726$$
$$\text{Root is 22, log} = 1.34242$$

To find the Root of a Decimal Fraction.

For the square-root, add 10 to the index before it is divided ; and for the cube-root, add 20, &c.

What is the square-root of .001849 ?

$$.001849, \text{ its log. is} = 7.26694$$
$$\text{Add 10}$$
$$2)17.26694$$
$$\text{Root .043, its log. is} = 8.63347$$

What is the cube-root of .125 ?

$$.125, \text{ its log. is } = 9.09691$$
$$\text{Add 20}$$
$$3)29.09691$$
$$\text{Root is .5, its log. } = 9.69897$$

*To find the Logarithm of the Sines, Tangents, and Se-
cants, belonging to any number of degrees and minutes.*

RULE.

If the degrees be less than 45, seek them on the top of
the page, and the minutes in the left hand column marked
M, against which, in the column signified at the top with
the proposed name, stands the sine, tangent, or secant
required; but when the degrees given, be more than 45,
seek them at the bottom, and the minutes in the right
hand column, marked M, against which, and over
the proposed name, stands the sine, tangent, or secant
required.

Observe, that the degrees at the top, and minutes in
the left hand column, added to the degrees at the bot-
tom, and minutes in the right hand column, always make
90°; hence, if a sine be looked for, the co-sine or comple-
ment will be found in the adjoining column. Observe
the same of tangents and secants.

EXAMPLES.

Required the logarithm sine of 28° 37' ?

Under 28°, and opposite 37', in the left hand column,
as above, and under the word *Sine*, stands 9.68029, the
logarithm of the sine of 28° 37', as required.

Required the logarithm tangent of 67° 45′?

Find 67° at the bottom of the page, and 45′ in the right hand column, opposite to which, and over the word *Tangent*, stands 10.38816, the log. required.

The logarithm of any number of degrees above 90, is found by subtracting the given degrees from 180°, and taking the logarithm of the remainder.

To find the Degrees, Minutes, and Seconds, to any given Logarithm.

Find the degrees and minutes corresponding to the nearest logarithm, which is exact enough for common business; but if seconds be wanted, they are thus found : take the difference between the given log. and the next less; also between the next less and greater; then say,

As the difference between the next less and greater log. Is to 60″ ;
So is the difference between the next less and given log. To the seconds required.

But if they be required to a given log. co-sine, then say,

As the difference between the next less and greater log. Is to 60″ ;
So is the difference between the given and next greater log.
To the seconds required.

EXAMPLES.

Find the degrees, minutes, and seconds, corresponding to the logarithm sine, 9.61405.

Next greater log. 9.61411   Given log. 9.61405
Next less   9.61382   Next less   9.61382
    29   Difference.   23

As 29 . . 60″ : : 23 . . 48″, to be annexed to the degrees and minutes corresponding to the next less log. gives 24° 16′ 48″, as required.

Find the degrees, minutes, and seconds corresponding to the logarithm co-sine 9.43297.

Next greater log. 9.43323   Next greater log. 9.43323
Next less   9.43278   Given   9.43297
    45   Difference.   26

As 45 . . 60″ : : 26 . . 34″, to be annexed to the degrees and minutes corresponding to the next less log. gives 74° 16′ 34″, as required.

To find the Logarithm Sine or Co-Sine, for Degrees, Minutes, and Seconds.

Find the logarithm to the degrees and minutes; take the difference between this and the next greater, if a sine: but if a co-sine, the next less; then say,

As 60″

Are to this difference ;

So are the given seconds,

To the correction, to be added to the first logarithm, if a sine ; but subtracted, if a co-sine.

EXAMPLES.

Required the logarithm sine of 24° 16′ 48″?

$$\begin{array}{ll} \text{Next greater log. is} & 9.61411 \\ \text{The log. of } 24°\;16′, \text{ is} & 9.61382 \\ \hline & 29 \\ \hline \end{array}$$

As 60′ .. 29 : : 48″ .. 23, to be added to 9.61382, gives 9.61405, the log. of 24° 16′ 48″, as required.

What is the logarithm co-sine of 74° 16′ 34″?

$$\begin{array}{ll} \text{The log. of } 74° \; 16′ \text{ is} & 9.43323 \\ \text{Next less, is} & 9.43278 \\ \hline & 45 \\ \hline \end{array}$$

As 60′ .. 45 : : 34′ .. 26, to be taken from 9.43323, leaves 9.43297, the log. co-sine of 74° 16′ 34″, as required.

TRIGONOMETRY.

PLAIN Trigonometry, is the art of measuring plain triangles, by comparing sides and angles together, by known analogies; whereby three things being given, a fourth may be found, on condition that one of them be a side : to do which, right lines are applied to the arch of a circle, described on the angular point, viz.

A chord is a line that divides the circle into two unequal parts, and is a chord to them both, as DH is the chord of the arches DH and DAH.

2. The sine of an arch, is a line drawn from one end, or termination of the arch, perpendicular to the radius, or it is half the chord of twice the arch, so that RS is the sine of the arch AS, and SZ the co-sine : the sine and co-sine making a quadrant, or 90°.

3. A versed sine, is that part of the diameter contained between the sine, and the arch, as RA and RCD, and is the versed sine of SHD, or DEP its equal.

4. A tangent of an arch, is a line drawn perpendicular to one end of the diameter, just touching the arch, as AT the tangent of the arch AS, and HG the co-tangent : the tangent and co-tangent making a quadrant, or 90°.

5. A secant of an arch, is a line drawn from the centre through the circumference, until it cuts the tangent, as CT is a secant of the arch SA, and GC the co-secant, meeting the co-tangent: the secant and co-secant also making a quadrant, or 90°.
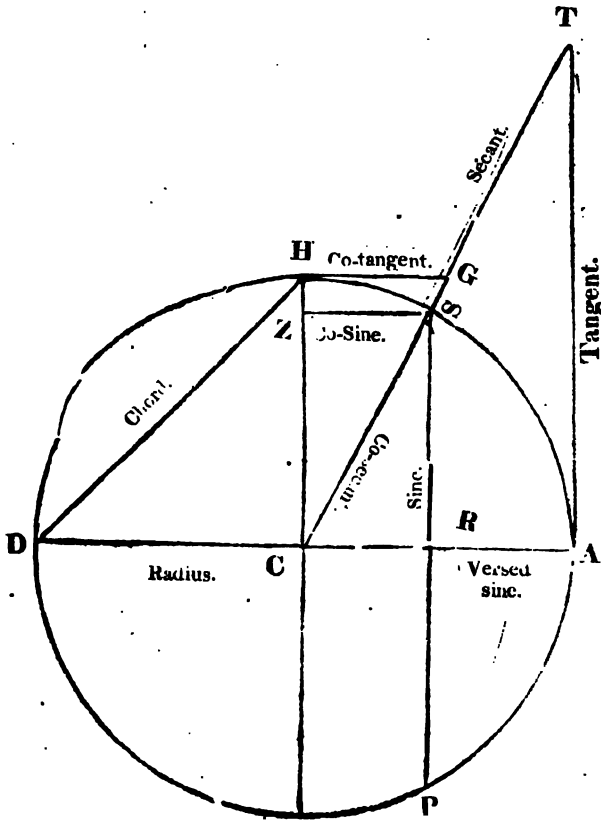
RIGHT ANGLED

TRIGONOMETRY.

THE solution of the several cases in Right Angled
Trigonometry, depends on the following Position, which
ought to be well committed to memory, and, by com-
paring it with the annexed figures, clearly understood
by the learner, before he proceeds. .

POSITION.

In every right angled triangle,

If the hypothenuse be made the radius of a circle,
the other two sides, or legs, will be, each the sine of its
opposite angle.

If either leg, including the right angle, be made the
radius of a circle, the other leg will be the tangent of its
opposite angle, and the hypothenuse the secant of the same
angle.

The foregoing Position, accurately compared with the
following figures, will be more instructive, than lengthy
demonstrations.

K
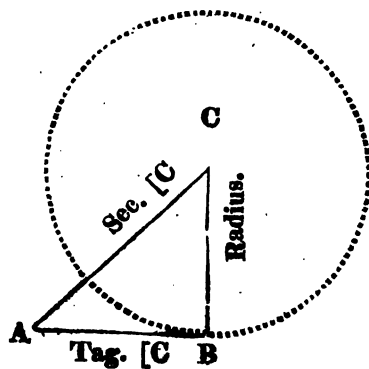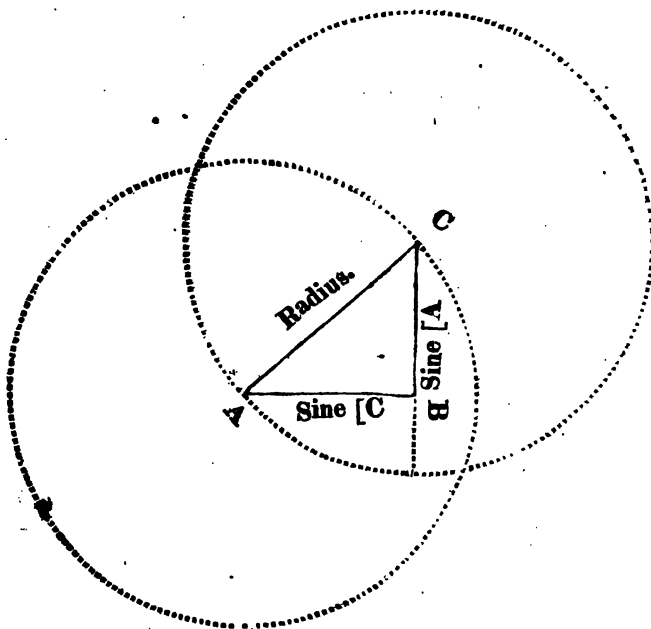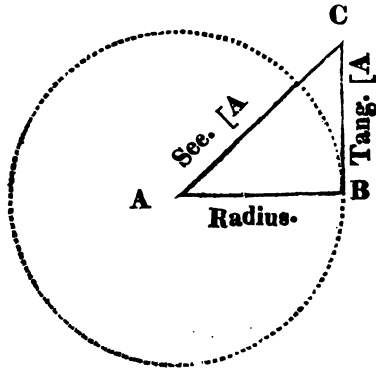
Note. When the hypothenuse is made radius, then the base is the sine of the opposite angle C ; and the perpendicular, a sine of the opposite angle A.

When the perpendicular is made radius, then the base is tangent of the opposite angle C, and the hypothenuse a secant of the same angle.

And when the base is made radius, then the perpendicular is tangent of the opposite angle A, and the hypothenuse a secant of the same angle.

When the angles. and one side are given, to find either, or both the other sides ; then either side may be made radius ; and each, in rotation, to prove the work.

RULE.

As the name on the given side,
Is to the same side ;
So is the name on the side required,
To the same side.

When two sides are given, to find the angles; then one of the given sides must be made radius.

RULE.

As the side made radius,
Is so radius;
So is the other given side,
To the name upon it.

CASE 1.

The Angles and Hypothenuse given, to find the Legs.

Given, the hypothenuse, 121 perches; the angle, opposite the base, 54° 30'; consequently the other angle, 65° 30', by position 2, page 10.

For the construction, see Problem 10, in Geometry.
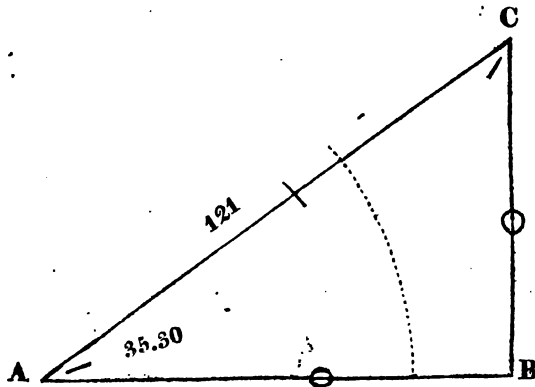
By making the Base Radius, it will be,

To find the perpendicular BC.

As secant [A	35° 30′	10.08931
Is to the hypothenuse 121		2.08279
So is tangent [A	35.30	9.85326

	11.93606
	10.08931

To the perpendicular BC 70.27	1.84675

To find the base AB.

As secant [A	35° 30′	10.08931
Is to the hypothenuse 121		2.08279
So is radius 90°		10.00000

	12.08279
	10.08931

To the base AB 98.50	1.99348

By making the Perpendicular Radius, it will be,

To find the perpendicular BC.

As secant [C	54° 30	10.23605
Is to the hypothenuse 121		2.08279
So is radius 90°		10.00000

	12.08279
	10.23605

To the perpendicular BC 70.27	1.84674

To find the base AB.

As secant [C	54° 30'	10.23605
Is to the hypothenuse	121	2.08279
So is tangent [C 54.30		10.14673
		12.22952
		10.23605
To the base AB	98.50	1.99347

By making the Hypothenuse Radius, it will be,

To find the perpendicular BC.

As radius	90°	10.00000
Is to the hypothenuse	121	2.08279
So is sine [A	35° 30'	9.76395
		11.84674
		10.00000
To perpendicular BC	70.27	1.84673

To find the base AB.

As radius	90°	10.00000
Is to the hypothenuse	121	2.08279
So is sine [C	54° 30'	9.91069
		11.99348
		10.00000
To the base AB	98.50	1.99348

BY GUNTER'S SCALE.

All proportions, where secants are not in them, may be worked by Gunter's Scale; the extent from the first to the third term, will reach from the second to the fourth : thus the last radius.

1. Extend from radius 90° to 54° 30', on the line of sines ; that extent will reach from the hypothenuse 121, to the base 98.50, on the line of numbers.

2. Extend from radius, to 35° 30', on the line of sines; that extent will reach from the hypothenuse 121, to the perpendicular 70.27, on the line of numbers.

CASE 2 & 3.

The Angles and one Leg given to find the Hypothenuse, and other Leg.

The angle opposite the perpendicular 33° 15', and the base 274 perches, are given, to find the hypothenuse and perpendicular.

For the construction, see Problem 44, in Geometry.

By making the Base Radius, it will be,

To find the perpendicular AB.

As radius 90°	10.00000
Is to the base 274	2.43775
So is tangent [C 33° 15'	9.81666

12.25441
10.0000

To the perpendicular AB 179.6   2.25441

To find the hypothenuse AC.

As radius 90°	10.00000
Is to the base 274	2.43775
So is secant [C 33° 15'	10.07765

12.51540
10.00000

To the hypothenuse 327.6   2.51540

By making the Perpendicular Radius, it will be,

To find the perpendicular AB.

As tangent [A 56° 45'	10.18334
Is to the base BC 274	2.43775
So is radius 90°	10.00000

12.43775
10.18334

To perpendicular AB 179.6   2.25441

To find the hypothenuse AC.

As tangent [A 56° 45′   10.18334
Is to the base BC 274   2.43775
So is secant [A 56.45   10.26099

                              12.69874
                              10.18334

To hypothenuse AC 327.6   2.51540

By making the Hypothenuse Radius, it will be,

To find the perpendicular AB.

As sine [A 56° 45′   9.92235
Is to the base BC 274   2.43775
So is sine [C 33° 15′   9.73901

                              12.17676
                              9.92235

To perpendicular AB 179.6   2.25441

To find the hypothenuse AC.

As sine [A 56° 45′   9.92235
Is to the base BC 274   2.43775
So is radius 90°   10.00000

                              12.43775
                              9.92235

To hypothenuse AC 327.6   2.51540
                  L

BY GUNTER.

Extend from 56° 45′, to 33° 15′ on the line of sines; that extent will reach from 274, the base, to 179.6, the perpendicular, on the line of numbers.   Again ;

Extend from 56° 45′, to radius 90°, on the line of sines; that extent will reach from 274, the base, to 327.6, the hypothenuse, on the line of numbers.

CASE 4 & 5.

The Hypothenuse, and one Leg given, to find the Angles, and other Leg.

Given the perpendicular, 69 chains or perches; the hypothenuse 150, to find the angles and base.

For the construction, see problem 12, in Geometry.
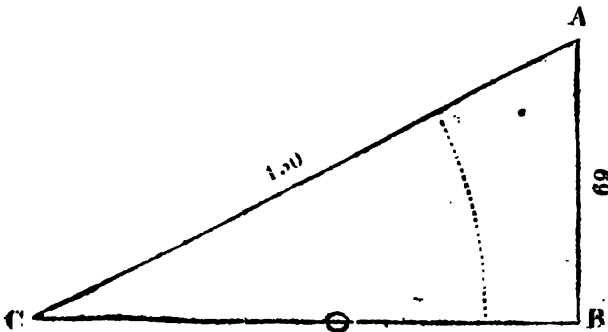
By making the Hypothenuse Radius, it will be,

(To find angle C.

As the hypothenuse 150   2.17609
Is to radius 90°   10.00000
So is the perpendicular 69   1.83885
                               _____
                               11.83885
                                2.17609
                               _____
To sine [C 27° 23'   9.66276
                               _____

To find the base BC.

As radius   90°   10.00000
Is to the hypothenuse 150   2.17609
So is the sine [A 62° 37'   9.94839
                               _____
                               12.12448
                               10.00000
                               _____
To the base BC 133.2   2.12448
                               _____

By making the Perpendicular Radius, it will be,

To find angle A.

As the perpendicular 69   1.83885
Is to radius   90°   10.00000
So is the hypothenuse 150   2.17609
                               _____
                               12.17609
                                1.83885
                               _____
To secant [A. 62° 37'   10.33724

To find the base BC.

As radius 90°	10.00000
Is to the perpendicular 69	1.83885
So is tangent [A 62° 37′	10.28568
	12.12453
	10.00000
To the base BC 133.2	2.12453

BY GUNTER.

Extend from 150, the hypothenuse, to 69, the perpendicular, on the line of numbers; that extent will reach from radius 90°, to 27° 23′, angle C, on the line of sines.

Extend from radius, 90°, to 62° 37′, angle A, on the line of sines; that extent will reach from 150, the hypothenuse, to 133.2, the base, on the line of numbers.

CASE   6 & 7.

The Legs given, to find the Angles and Hypothenuse.

Given the perpendicular, 980 perches; the base 690, to find the angles and hypothenuse.

For the construction, see problem 13, in Geometry.
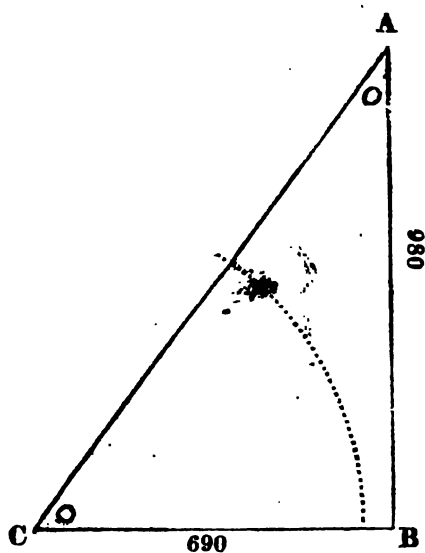
By making the Base Radius, it will be,

To find angle C.

As the base 690	2.83885
Is to radius 90°	10.00000
So is the perpendicular 980	2.99123
	12.99123
	2.83885
To tangent [C 54° 51'	10.15238

To find the hypothenuse AC.

As radius 90°	10.00000
Is to the base 690	2.83885
So is secant [C 54° 51′	10.23979
	13.07864
	10.00000
To the hypothenuse 1198	3.07864

By making the Perpendicular Radius, it will be,

To find angle A.

As the perpendicular 980	2.99123
Is to radius 90°	10.00000
So is the base 690	2.83885
	12.83885
	2.99123
To tangent [A 35° 9′	9.84762

To find the hypothenuse AC.

As radius 90°	10.00000
Is to the perpendicular 980	2.99123
So is secant [A 35° 9′	10.08743
	13.07866
	10.00000
To the hypothenuse 1198	3.07866

BY GUNTER.

The extent from 690 to 980, on the line of numbers, will reach from radius 45°, to 54° 51', on the line of tangents.

The extent from 33° 9', to radius 90°, on the line of sines will reach from 690, the base, to 1198, the hypothenuse.

The work to the preceding cases being all set down ; and as a good knowledge of Trigonometry is the basis of the Mathematics, an example in each case, with their answers, is annexed, for the benefit of the learner.

1. Given the hypothenuse, 250 perches or chains ; the angle opposite the base, 54° 30', to find the base and perpendicular.

Answer ; the base 203.5 ; perpendicular 145.2.

2. Given the angle opposite the perpendicular 33° 15 ; the base 325, to find the hypothenuse and perpendicular.

Answer ; the hypothenuse 388.6 ; perpendicular 213.4.

3. Given the perpendicular 91 ; the hypothenuse 170, to find the angles and base.

Answer : the angle opposite the perpendicular 32° 22 ; consequently, the other angle 57° 38', (by position 2, page 10) and the base 143.6.

4. Given the base 787 ; the perpendicular 890, to find the angles and hypothenuse.

Answer ; the angle opposite the base, 41° 29' ; consequently, the other angle (by position 2, page 10) 48° 31', and the hypothenuse 1188.

OBLIQUE ANGLED

TRIGONOMETRY.

POSITION. ●

IN all plane triangles, the sides are in direct proportion to the sines of their opposite angles, and the contrary.

When the angles, and one side are given, to find the other sides, or either of them.

RULE 1.

As the sine of the angle opposite the given side,
Is to the given side;
So is the sine of the angle opposite the side required,
To the side required.

When two sides, and an angle opposite to one of them, are given, to find the other angles and side.

RULE 2.

As the side opposite to the given angle,
Is to the sine of the given angle;
So is the other given side,
To the sine of its opposite angle.

Then find the side (if required) by

CASE 1.

Two Angles, and a Side given, to find the other two Sides.

The angle BDC 101° 25', and CBD 44° 42', and the side BC 76 perches given, to find the sides CD and BD; consequently, (by position 3, page 11) the other angle is 33° 53'.

For the construction, see problem 14, in Geometry.
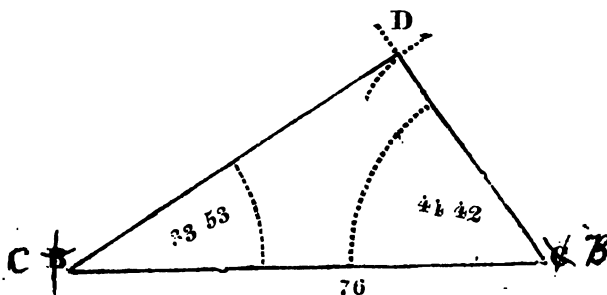
To find DC.

As sine supplement of angle D 101° 25'   9.99132
Is to the side BC 76   1.88081
So is sine [B 44° 42'   9.84720
                                          _____
                                           11.72801
                                            9.99132
                                          _____
To the side DC 54.53   1.73669

M

To find BD.

As supplement of sine [D 101   9.99132
Is to the side BC 76   1.88081
So is sine [C 33° 53'   9.74625
                           11.62706
                           9.99132

To the side BD 43.23   1.63574

BY GUNTER.

The extent from the supplement of [D = 78° 35', to [B 44° 42', on the line of sines, will reach from the side BC 76, to the side DC 54.53, on the line of numbers.

The extent from 78° 35', to [C 33° 53', on the line of sines, will reach from the given side 76, to the side BD 43.23, on the line of numbers.

CASE 2 & 3.

Two Sides, and an Angle opposite one of them given, to find the other Angles, and third Side.

The side BC 106, and BD 65, and the angle BCD 31° 49' given to find the other angles, and side CD.

For the construction, see problem 15, in Geometry.

D
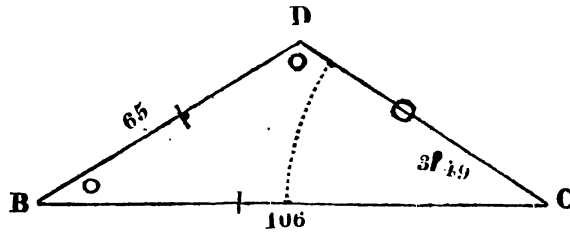
Note. When the given angle is obtuse, the required angle will be acute; but when the given angle is acute, then it is sometimes doubtful, whether the equired angle be ob·use, or acute, and ought to be determined by drawing and viewing the figure, before further procedure ;

Or by this general Rule.

Square each side ; then, if the square of the side opposite the required angle, be more then the sum of the squares of the other two sides, the required angle is obtuse ; if they be even, the angle is right ; and if the square of the side opposite the required angle, be less than the sum of the squares of the other two sides, then the angle is acute—thus, in the foregoing figure, the required angle D, is obtuse.

To find angle D.

As the side BD 65	1.81291
Is to sine angle C 31° 49'	9.72198
So is the side BC 106	2.02531

	11.74729
	1.81291

To sine of supplement [D 59° 17' $\Big\}$ 9.93438
— 180° = 120° 43' [D

By position 3, page 11, angle B, will be found to be 27° 28'.

To find the side DC.

As sine angle C 31° 49′	9.72198
Is to the side BD 65	1.81291
So is sine angle B 27° 28′	9.66392
	11.47683
	9.72198
To the side DC 56.86	1.75485

BY GUNTER.

The extent from 65 to 106, on the line of numbers, will reach from 31° 49′, to 59° 17′, on the line of sines.

The extent from 31° 49′, to 27°, 28′, on the line of sines, will reach from 65 to 56.86, on the line of numbers.

CASE 4 & 5.

Two Sides, and their contained Angle given, to find the other Angles, and third Side.

The side BC 109, BD 76, and their contained angle CBD 101° 30′ given, to find the other angles, and side CD.

RULE.

As the sum of the sides,
Is to the tangent of half the sum of the unknown angles;
So is the difference of the sides,
To the tangent of half the difference of the unknown angles.

To half the sum, add half the difference, and the sum will be the greater angle; and from half the sum, take half the difference, and the remainder will be the less angle.

For the construction, see problem 16, in Geometry.
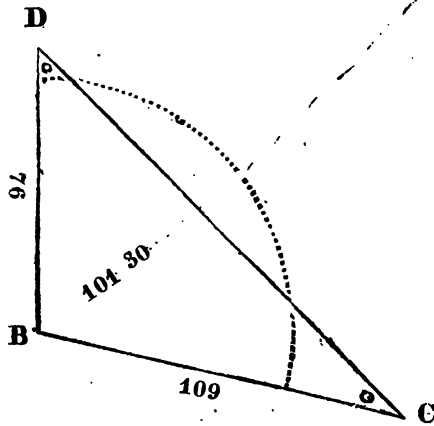
Side BC 109   109 From 180°
     BD 76   76 Take 101° 30′, the given angle.

Sum   185 Diff. 33 Rem. 78° 30′, the sum of the un-

known angles; (by position 3, page 11) the half of which sum, is 39° 15′.

To find the difference of the angles D and C.

As the sum of the sides BC and BD = 185 2.26717
Is to the tan. of ½ the sum of the [s C&D= 39° 15′ 9.91224
So is the diff. of the sides BC and BD = 33   1.51851

                             11.43075
                             2.26717

To the tang. of ½ the diff. of the [s C & D 8° 17′ 9.16358

To half the sum of the angles, 39 15', add half their difference, 8° 17' ; the sum is 47° 32', the greater angle D, because it is opposite the longer side (by position 10, page 16) and from half the sum, take half the difference : the remainder is 30° 58', the less angle C.

Having the angles, the side is found by Case 1.

To find DC.

As sine angle D 47 32'	9.86786
Is to the side BC 109	2.03743
So is supplement of sine angle B 101° 30'	9.99119
	12.02862
	9.86786
To the side DC 144.8	2.16074

BY GUNTER.

The extent from 185 to 33, on the line of numbers, will reach from 39° 15', to 8° 17', on the line of tangents.

The extent from 47° 32', to 78° 30', on the line of sines, will reach from 109 to 144.8, on the line of numbers.

CASE 6.

The Sides given, to find the Angles.

The side BC 105, BD 85, and CD 50, given, to find the angles BDC, BCD, and CBD.

RULE.

Divide the triangle into two right angled triangles, by letting fall a perpendicular from the point D, which will divide the base BC, into two bases of unknown lengths. viz. BA, and CA. Then say,

As the sum of the bases BA and CA,
Is to the difference of the sides BD and DC;
So is the sum of the sides BD and DC,
To the difference of the bases BA and GA.

Then to half the sum of the bases BA and CA, add half their difference, and the sum will be the greater base BA; and from half the sum, take half the difference, and the remainder will be the less base CA.

For the construction, see problem 17, in Geometry.
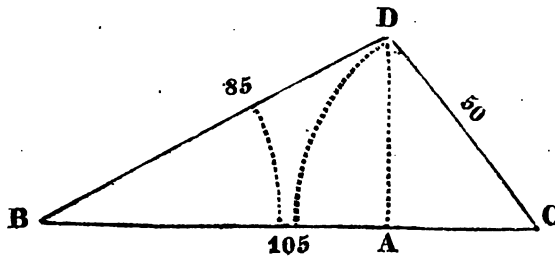
	The sides			
	BD	85	85
	CD	50	50
	Sum	135	Diff.	35

To find the difference of the bases.

As the sum of the base BA and CA 105   2.02119
Is to the difference of the sides BD & CD 35   1.54407
So is their sum 135   2.13033
                                            _____
                                            3.67440
                                            2.02119
                                            _____
To the diff. of the bases BA and CA ½) 45   1.65321
                                            _____
                              22.5
                              _____

To half the sum, 52.5, add half the difference, 22.5, the sum is 75, the greater base BA, and subtracted, leaves 30, the less base CA.

By right angled Trigonometry, to find the Angles.

To find [B.

As the base BA 75   1.87506
Is to radius 90°   10.00000
So is the hypothenuse BD 85   1.92942
                                   _____
                                   11.92949
                                    1.87506
                                   _____
To secant [B 28° 5'   10.05443

To find [C.

As the base CA 30   1.47712
Is to radius 90°   10.00000
So is the hypothenuse CD 50   1.69897
                                   _____
                                   11.69897
                                    1.47712
                                   _____
To secant [C 53° 9'   10.22185

By position 3, page 11, 180 — 53° 8' + 28° 5', = 98° 47' = ang. BDC, the several angles required.

BY GUNTER.

The extent from 105 to 135, will reach from 85 to 45, on the line of numbers.

The extent from 85 to 75, on the line of numbers, will reach from radius to 61° 55', [BDA, on the line of sines.

The extent from 50 to 30, on the line of numbers, will reach from radius to ang. ADC 36° 59', on the line of sines.

Examples for Practice.

1. Given the angle BDC 100°, and the angle DCB 54°, the leg BD 220 perches, to find the other two legs.

Answer; BC 267.8, DC 119.2. Tables vary in this sum.

2. Given the side BC 365, and the side AB 640, the angle BAC 26°, to find the other side and angles.

Answer; the side AC 808.7, ang. at C 50° 14', B 103° 46'.

3. Given the side BC 110, AC 80, and their contained angle 102° 30', to find the other angles and side.

Answer; the greater angle 45° 58', the less angle 31° 32', and the third side 149.3.

4. Given the side BA 88, BC 54, AC 108, to find the angles.

Answer; the least angle 29° 49', next greater 54°, 07', and the greatest 96° 04'.

N

the two altitudes, is 18° 30′; and of course the angle AEC 138° 30′, by position 3; hence the height of the object will be found to be 110.5 feet. And by Right Angled Trigonometry, the height of the hill may be found to be 101.8 feet and depth to the perpendicular distance of the object 90.12 feet.

Angles {
ACB 23°,
CAB 18° 30′,
ABC 130.30.
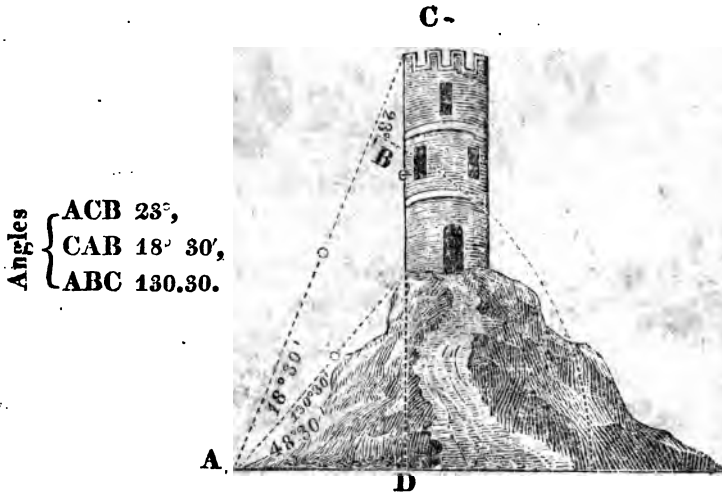
PROBLEM III.

From the top of a Hill to find the Height of a perpendicular Object, at the foot thereof.

Given {
Angle to the foot of the object 55° 15′,
Angle to the top 31° 15′,
Distance to the foot of the object 250 feet.

Note. By the same Case, as the last Problem, the height of the object will be found to be 119 feet; the horizontal distance AE, 142.5 feet, and height of the hill 205.4 feet; from the height of the hill, take the height of the object, leaves 86.4 feet; that the hill is above the object.

Angles {
ABE 34° 45',
CAB 24°,
BCA 121° 15',
ECA 58° 45'.

The adding and subtracting these of angles, are omitted to try the judgment of the learner.

PROBLEM IV.

To take the Height of an inaccessible Object, on a plane, at two Stations.

Given {
Angle at the nearest station to the top 55°,
Stationary distance 87 feet backwards,
Angle at the farthest station to the top 37°.

RULE.

By Case 1, Oblique Angled Trigonometry, find the distance from either station, to the top of the object; from the nearest is 169.4 feet; from the farthest is 230.6 feet; then, by Right Angled Trigonometry, the height of the object will be found to be 138.8 feet.

Angles { ACD 53°,
         BCD 35°,
         ACB 18°,
         ABC 125°.
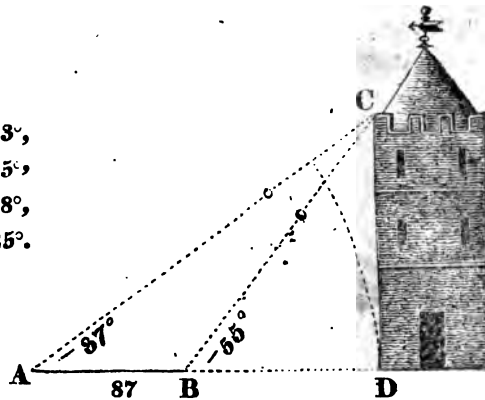
PROBLEM V.

Let BC be a pole 100 feet high, and broken off at **D**, so that the part broken off, viz. DC, will reach from the top of the stump to A, on a plane 34 feet from the bottom or foot of the pole. Required the length of the part broken off?

RULE.

In the right angled triangle ABC, the base and perpendicular are given, to find the angles; and by Case 6 and 7, Right Angled Trigonometry, the angle ACB will be found to be 18° 47', and 90° — 18° 47' = 71° 13' CAB; then by position 8, page 15, intersect BC, in the broken place at D; then, by position 11, page 16, AD and CD being equal, their opposite angles must be equal; therefore, CAB 71° 13' — ACB 18° 47' = DAB 52° 26'; then,

in the right angled triangle ABD, the angles and base are given to find the hypothenuse AD 55.77 feet, the part required.

(See the following figure.)
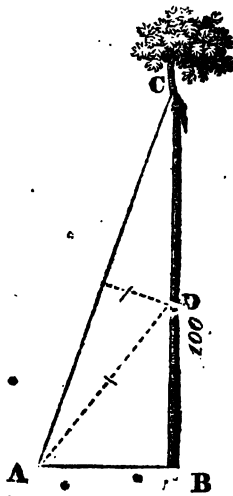
PROBLEM VI.

To take the Height of a perpendicular object, on a Hill, at two Stations, from a Plane beneath it.

Given { Farthest station, angle to the bottom 21°,
angle to the top 35°,
Stationary distance 104 feet directly forwards,
Nearest station, angle to the top 48° 36′.

RULE.

By Case 1, Oblique Angled Trigonometry, find the distance from the farthest station to the top of the object, viz. 333.6 feet; then by the same, the height of the object will be found to be 86.76 feet.

Note. The addition and subtraction of the angles, are omitted to exercise the judgment of the learner.

$$
\text{Angles}
\begin{cases}
\text{ACB } 13^\circ\ 30' \\
\text{BAC } 35.00 \\
\text{DAC } 14.00 \\
\text{DAE } 21.00 \\
\text{ADC } 111.00 \\
\text{ABC } 131.30
\end{cases}
$$
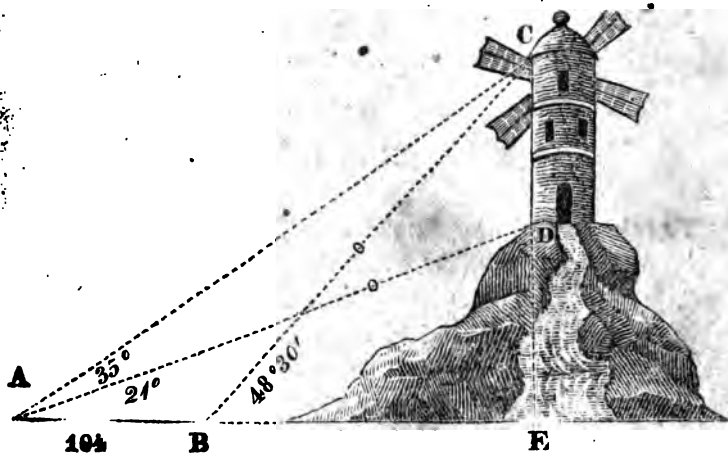
PROBLEM VII.

To find the Length of an Object which stands obliquely on a Hill, at two stations, on a Plane beneath it.

Given

  Nearest station, angle to the bottom 36° 30′,
                     angle to the top   44° 30′,
  Stationary distance, 104 feet backward,
  Farthest station, angle to the bottom 24° 30′,
                 angle to the top   32°.

RULE.

By Case 1, Oblique Angled Trigonometry, find the distance from either station to the top and bottom of the object, as from the nearest to the top 254.7 feet, and to the bottom 207.4 feet; then by Case 4 and 5, the length of the object may be found to be 57.15 feet.

Angles

  ACB 12° 30′, to find BC 254.7 feet,
  ADB 12°, to find BD 207.4 feet,
  CBD 8°, to find the length of the object 57.15 feet.

O

C

D

32°

24° 80'

74°30'
56°30'

A

104 feet.   B   E

PROBLEM VIII.

To find how high a person at Philadelphia, must be raised into the atmosphere, and how far the sight must extend, to see London; the distance being 51 Degrees, on the Rotundity of the Earth, and the Diameter of the Earth 7964 Miles.

RULE.

From right to left, draw a line, to represent the earth's diameter, on which describe a circle with the chord of 60°; from the centre, raise a perpendicular, and where it cuts the circle, will represent Philadelphia, as at A, from which lay off 51 degrees, to represent London, as at B; from the centre, draw a line to B, and on the point B, raise a perpendicular to intersect the former at V; then.

in the right angled triangle CBV, the angle VCB 51°, and base CB 3982 miles, are given to find the hypothenuse CV, from which, take the earth's semidiameter, leaves AV 2345 miles, the height required; and VB. 4917 miles, is the distance the sight must extend, to see London.

Note. The operations the same as Case 1, Right Angled Trigonometry.
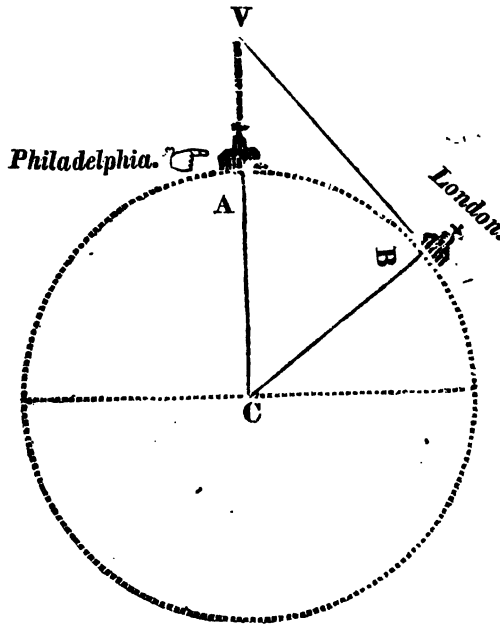
'OF

DISTANCES.

PROBLEM I.

LET A and B be two houses on one side of a river, 293 perches asunder ; and a tower at C, on the opposite side of the river, which makes an angle at A, with the line AB of 53° 20′; and at B, with the line BA of 66° 20′. Required, the distance from the tower to each house ?

.*Ans.* { To A 308.8 perches
To B 270.5 perches

Note. This is performed by Case 1, Oblique Angled Trigonometry.

C

A ⌂ ———————— ⌂ B

293 perches.
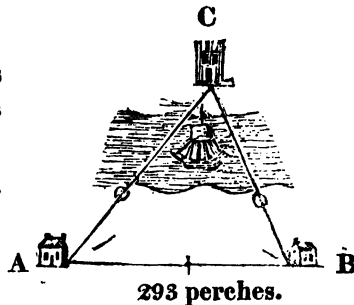
PROBLEM II.

Let B and C be two houses, and an observer at A 252 perches from B, and 230 from C, finds that they make an angle at A of 70°. The distance between the houses is required ?

Answer, 277 perches.

Note. This is performed by Case 4 and 5, Oblique
Angled Trigonometry.
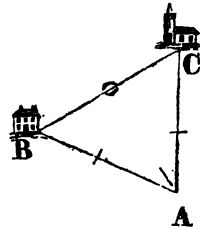
PROBLEM III.

Let **D** and **C** be two trees in a bog, and an observer at
A and **B** 113 perches asunder, finds, that when at **A**, the
tree at **D** makes an angle with the line **AB** of 100° ; and
that at **C**, makes an angle with the line **AB**, of 36° 30′ ;
and when at **B**, the tree at **D** makes an angle with the
line **BA** of 49°, and that at **C** of 121°.   Required the
distance these trees are asunder?

Answer 232.5 perches.

Note. By Case 1, Oblique Angled Trigonometry, find the distance from
either station to each tree, as from B to D 216 perches ; and to C 175.6
perches ; then, by Case 4 and 5, find their distance apart.
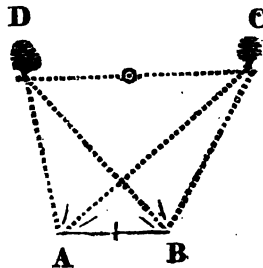
TO FIND THE

CONTENT OF LAND,

GEOMETRICALLY.

PROBLEM I.

To find the Content of a Square Piece of Land.

RULE.

Multiply the base into the perpendicular, and if they be in chains, divide the product by 10, for acres; and multiply the remainder by 4, for roods, and by 40 for perches; But if in perches, divide by 40 and by 4, for acres, roods and perches, as in the subsequent example.

EXAMPLE.

Let ABCDA be a square field, and each side 7 chains 29 links. Required the content, and to lay down a map by a scale of ten perches to an inch.

Chains.		Perches.
7.29	=	29.16
7.29	=	29.15
A. 5,3.1441		4,0)85,0.3056
4		
R. 1,25764		4)21 10 P.
40		A. 5 1 10.3056
P. 10,30560		

D   C

A. R. P.

Answer   5   1   10.3056

Both ways the same.

A   B
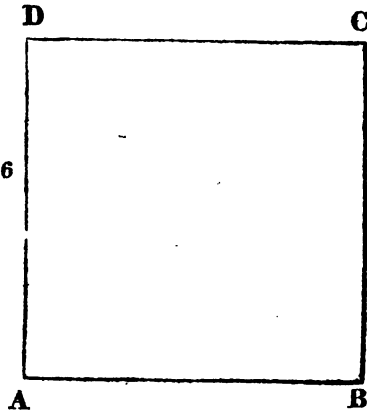
PROBLEM II.

To find the side of a Square, when the content is given.

RULE.

Reduce the given content into perches, and take the square root thereof for the side required in perches, which reduce to chains.

EXAMPLE.

Required to lay out a square piece of ground, which shall contain 12 acres, 3 roods, and 16 perches, and to lay down a map thereof by a scale of 20 perches to an inch.

        A. R. P.
Given area 12 3   16
          4
          —
         51
         40
    ₂ ——   Perches. Chains.
    √ 2056 = 45.34 = 11.33½, one side required.

(See the above Figure.)

PROBLEM III.

To find the Content of an Oblong piece of Ground.

RULE.

Multiply the length by the breadth, and divide as in Problem 1.

EXAMXPE.

Let ABCD be an oblong piece of ground 7.25 chains long, and 4.37 chains wide. Required the area thereof, and to lay down a map by a scale of 20 perches to an inch.

	Chains.		Perches.
Length	7.25	=	29.00
Breadth	4.37	=	17.48

A. 3|1.6825   4|0)50|6.9200
          4
                          4)12   26 P.
        ,67300
            40   3A. 0R. 26.P.

P. 26|92000

A. R. P.
Answer 3   0   26.92; both ways the same.
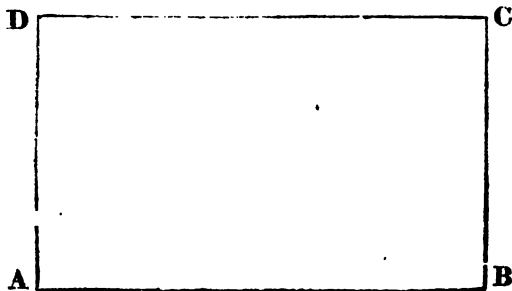
PROBLEM IV.

The Content of an Oblong Piece of Ground, and one Side given, to find the other Side.

RULE.

Divide the content in perches, by the given side in perches; the quotient will be the side required in perches.

EXAMPLE.

Suppose a ditch 7.25 chains long, by the side of which it is required to lay out a piece of ground that shall contain 3A. 0R. 26.92P. the breadth from the ditch is required?

$$
\begin{array}{ccc}
\text{A.} & \text{R.} & \text{P.} \\
3 & 0 & 26.92 \\
4 & & \\
\hline
12 & & \\
40 & & \\
\end{array}
$$

$$\text{P} \overline{\qquad} \text{P.}$$

Given side $= 29)506.92(17.48 = 4.37$ chains.

Note. The two last Problems prove each other.

(See the last Figure.)

P

PROBLEM V.

To find the Content of a Rhombus, or Rhomboides.

RULE.

Multiply the length into the breadth, and divide as in Problem 1.

EXAMPLE.

Let ABCD be a piece of ground, in form of a Rhombus, or Rhomboides, whose base AB, is 11 chains, and perpendicular height 10 chains. Required the content?

	Ch.		Per.
Base	11	=	44
Perpendicular	10	=	40

Acres 11|0   4|0)176|0

4)44

Acres 11 Answer.
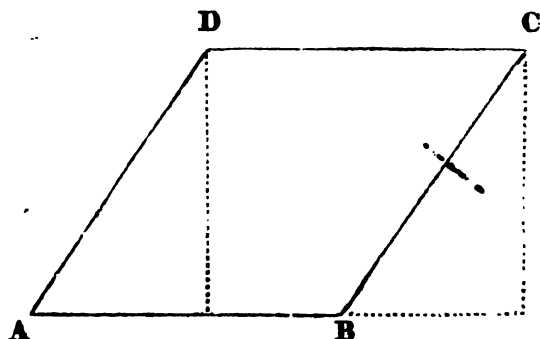
PROBLEM VI.

To find the Content of a Triangular Piece of Ground.

·RULE.

Multiply the base, by half the perpendicular;
Or, half the base by the perpendicular;
Or, take half of the product of the base and perpendicular; then divide as before.

：   EXAMPLE.

Let DBC be a triangular piece of ground, the base BC 12.38 chains, and perpendicular CD 6.78 chains. Required; the content?

		Ch.
		Base 12.38
Ch.	Ch.	Perp. 6.78
Base 12.38	½ Base 6.19	—————
½ Per. 3.39	Perp. 6.78	½)839364
A.4|1.9682	= 41.9682	= 41.9682 sqr. chains.
4		
—————		
,78728		
40		
—————		
P. 31|49120		

Answer 4A.   OR.   31.4912P.

If the base and perpendicular be taken in perches, it will produce the same.
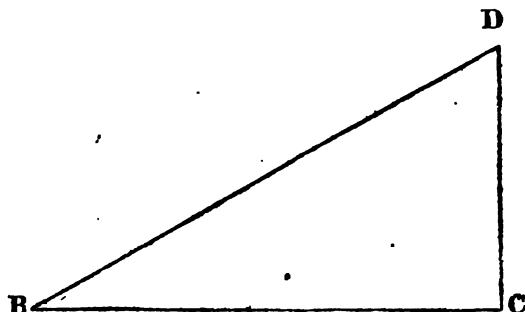
PROBLEM VII.

The Content of a Triangular Piece of Ground, and the Base given, to find the Perpendicular.

RULE.

Divide the content in perches, by half the base in perches; the quotient will be the perpendicular in perches.

EXAMPLE.

Let BC be a ditch 12.40 chains long; by which it is required to lay out a triangular piece of ground, that shall contain 4A. 1R. 10P. Required the perpendicular?

```
                 A.   R.   P.
           Area  4    1    10.
                 4
                 —
                 17
                 40
       C.      P. ——— P.      C.L.
½ base  6.20  =  24.8)690( 27.82=6.95 ⅓ perpendicular.
```

(See the last figure.)

PROBLEM VIII.

To find the Content of a Trapezium.

RULE.

Multiply the sum of the perpendiculars into the base, and take half the product for the square measure, and divide as in Problem 1.

EXAMPLE.

Let ABCD be a field, in form of a Trapezium; the base AC 16.10 chains, the perpendicular Bb 3.40 chains, and Dd 6.80 chains. Required the area?

Note. Bb 3.25 chains from A ; and Dd 5.57 chains from C.

```
          Ch.   Ch.   Ch.        Per.
Perpens.  6.80+3.40=10.20    =   40.8 their sum.
 Base               16.10   =    64.4
                    ———————        ————
              ½)164.2200=½)2627.52
               ————————   ————————    A.  R.  P.
                82.1100 = 1313.76=8   0   33.76
               ————————   ————————
```
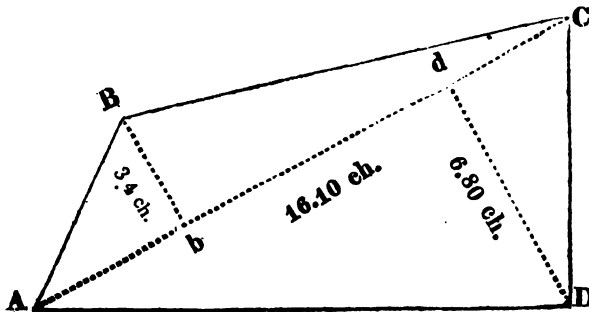
PROBLEM IX.

To find the Content of a Field, bounded by four Sides, two of which are parallel, but unequal.

RULE.

Multiply the sum of the parallel sides into their perpendicular distance; take half the product, and divide as in Problem 1.

EXAMPLE.

Let ABCD be a field, and the parallel sides AD and BC respectively 7.20, and 12.25 chains; and their perpendicular distance 15.40 chains. Required the area?

```
                        Ch.
Perpendiculars { 7.20
               { 12.25
                                    P.
Sum of Perpen.   19.45     =       77.80
Perpen. distance. 15.40    =       61.60

          ½)299.5300   =  ½)4792.4800

          149.7650    =    2396.24  =  14A. 3R. 36P.
```

ABCD is equal to ABEF.

(See the following Figure.)
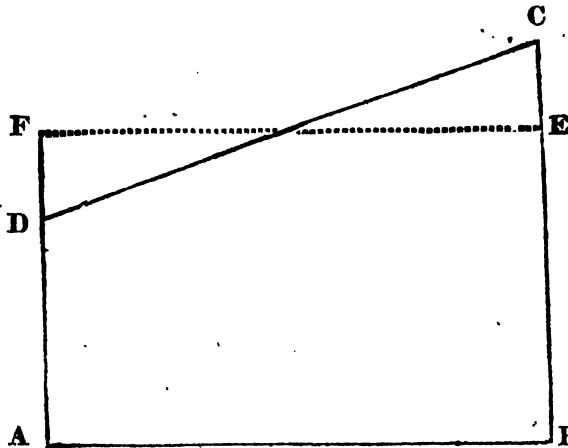
PROBLEM X.

Two Sides of a Triangle, and their contained Angle given,
to find the Area.

RULE.

As radius,
Is to the log. of the two sides ;
So is the sine of the contained angle (or its supplement
to 180°, if obtuse)
To the log. of the double area.

EXAMPLE.

In the triangle ABC, the lines AB and AC respective-
ly, are 16, and 10.12 chains, and their contained angle
30 degrees. Required the area.

Ch.

$$\text{Log. of diameter 80} \left.\begin{array}{r} 1.90309 \\ 1.90309 \end{array}\right\}$$

$$\begin{array}{r} 3.80618 \\ 0.10491 \end{array}$$

Log. of area 5026.5   3.70127

Area 502A. 2R. 24P. as before.

(See the following figure,)

80 chains.

502A. 2R. 24P.
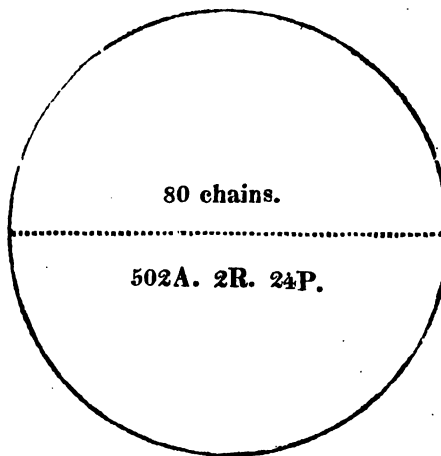
EXAMPLE 2.

Suppose a circle of 100 perches diameter, is inclosed with a wall; and near the middle of this inclosure, is

an elliptical fish pond 10 perches long, and 5 wide. Required the length of the wall, content of the inclosure, and area of the pond?

Diameter   100
Multiplied by 3.14159
_____

The circumfer. 314.15900 perches.
_____

Or take 314.16, as in the former example, the content of the circumference = 49A. 0R. 14P.

P.
Elliptic diameters { 10   1.00000
           5   0.69897
_____

          1.69897
          0.10491
_____

P.   1.59406

Area of the pond 39.27

49A. 0R. 14P.
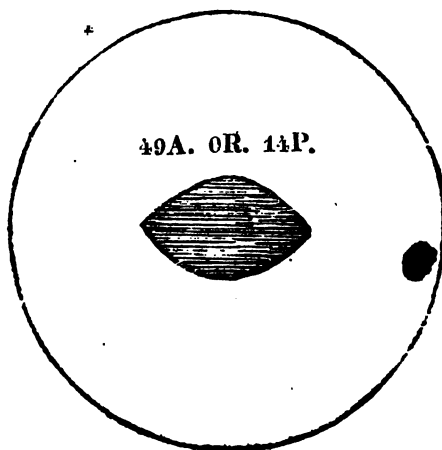
PROBLEM XII.

The Area of a Circle given, to find the Diameter.

RULE.

To the logarithm of the area, add 0.10491, and half the sum will be the logarithm of the diameter,

Or, divide the area by .7854, and the square root of the quotient will be the diameter.

EXAMPLE.

Required the radius of a Circle, to inclose one acre of ground ?

	A.	P.	
	1 = 100	2.20412	
		0.10491	

$\frac{1}{2}$)2.30903

P..
The diameter $\frac{1}{2}$)14.27   1.15451 Log.

The radius   7.135 Answer.

Radius.

1 Acre.
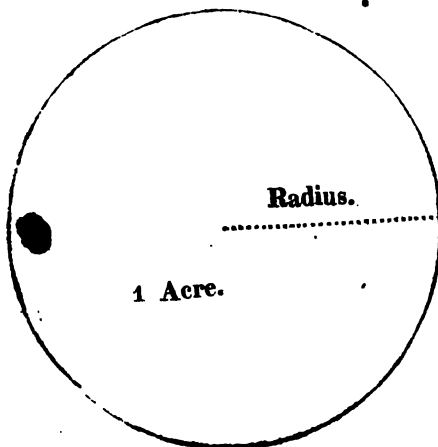
PROBLEM XIII.

To lay out an Oblong Piece of Ground, so that the Length shall bear a given Proportion to the Breadth.

RULE.

As the less number,
Is to the given area in square perches ;
So is the greater number,
To the square of the longest side ; (the square root of which will be the longest side in perches.)   And,

As the greater number,
Is to the given area, in square perches ;
So is the less number,
To the square of the shortest side ; (the square root of which, will be that side in perches.)

EXAMPLE.

Let it be required to lay out an oblong piece of ground to contain 864 acres, and the breadth to bear the same proportion to the length, as 3 does to 5.

864 acres = 138240 perches.

As 3 .. 138240 :: 5 .. $\sqrt{230400}^2$ = 480 perches, the length required.

As 5 .. 138240 :: 3 .. $\sqrt{82944}^2$ = 288 perches, the breadth required.

Any quantity of land may be laid out, or inclosed, in the form of

A.	Square	By Problem	II.	Page 103
	Oblong, 1 side given		IV.	105
	proportion given,		XIII.	117
	diff. of *Lat.* & *Bear.* given,		XIV.	118
	Triangle, the base given,		VII.	108
	Circle,		XII.	

PROBLEM XVI.

To Map a Survey, from the Field Notes, and find the Content thereof.

RULE.

Draw a line on the paper, to represent the first meridian ; put *N* at the top, for North ; *S* at the bottom, for South ; *E* at the right hand, for East ; and *W* at the left hand, for West ; (for in making, or viewing maps, we always suppose to face the North) then, in a convenient place, make a point in the line, for the first station lay the straight edge of the Protractor to the line, with the centre mark to the point ; turn the arch of the Protractor East or West, as the bearing is ; and from the North or South end of the Protractor, as indicated by the bearing, prick off the degrees mentioned ; then, through this point, draw a line from the first, on which lay the first distance, and through this last point, draw a line parallel to the first meridian : to this second meridian, and at the end of the first distance, lay the Protractor as above said, and so proceed from station to station, and close at the place of beginning.   Then dispose the map into triangles and trape-

ziums; measure the several bases and perpendiculars, on the same scale that the map was laid down from; find the content of each triangle and trapezium, by the preceding problems, and their sum will be the area of the map.

EXAMPLE 1.

Required to lay down a Map of 20 Perches to an inch, from the following Notes, and find the Content.

Beginning at a stone, corner of AB's land; from thence,
N. 43° ¾ E. 10.51 chains, to a stake; thence,
S. 54° ½ E. 14.20 chains, to a sapling, corner of CD's land; thence,
S. 49° ½ W. 13.45 chains, to an oak tree; thence,
N. 42° ¼ W. 12.75 chains, to the place of beginning.

			Ch.	Per.
N. 43° ¾	E.	10.51	=	42.04
S. 54° ½	E.	14.20	=	56.80
S. 49° ½	W.	13.45	=	53.80
N. 42° ¼	W.	12.75	=	51.00

Perches.

Perpendiculars $\begin{cases} 35.4 \\ 31.0 \end{cases}$

66.4
Base   7 5.

½)498 00 double area.

4,0)249,0
  4)62 10

Acres 15 2 10 Answ.

(See the following figure.)

R
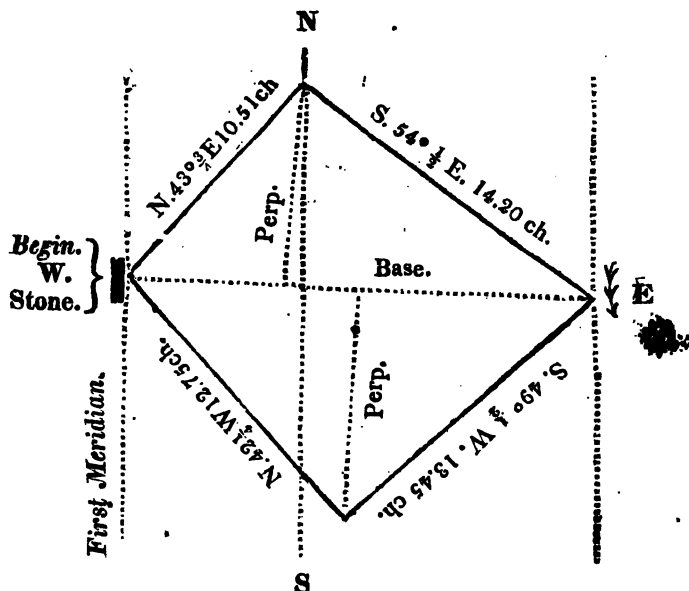
EXAMPLE 2.

The following notes are proposed to lay down a Map
40 perches to an inch, and find the content.

				Ch.	Per.
1.	S.	40°	W.	17.50	= 70.
2.	N.	45°	W.	22.25	= 89.
3.	N.	36	E.	31.25	= 125.
4.	North			13.60	= 54.4
5.	S.	81°	E.	46.50	= 186.
6.	S.	8°	W.	34.25	= 137.
7.	West			32.55	= 130.2

Note. In Practical Surveying, it is necessary to particularize every cor-
ner, and on whom each line bounds; which, to avoid prolixity, I omit
in this treatise.

In the following Maps, I shall number the bases of the
several triangles and trapeziums.
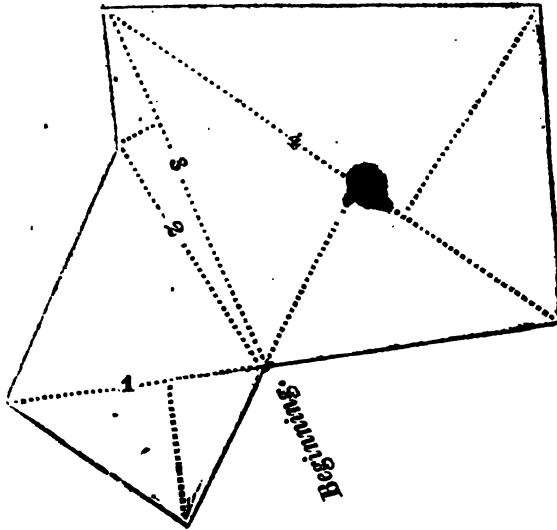
	Bases.	Perpen.	Double Area.
1.	108.3	58.	6281.4
2.	125.	92.	11500.0
3.	165.	11.	1826.0
4.	233.	91. } 110. }	46833.0

$$\frac{1}{2})66440.4$$

$$4,0)33322,0.2$$

$$4)830\ 20$$

Area A. 207 2 20 Answer.

EXAMPLE 3.

The following Notes are proposed, to lay down a Map of 40 Perches to an inch, and find the Area.

				Chains.		Perches.
1.	N.	75°	E.	13.70	═══	54.8
2.	N.	20°½	E.	10.30	═══	41.2
3.	East			16.20	═══	64.8
4.	S.	33°⅓	W.	35.30	═══	141.2
5.	S.	76°	W.	16.00	═══	64.0
6.	North			9.00	═══	36.0
7.	S.	84°	W.	11.60	═══	46.4
8.	N.	53°¼	W.	11.60	═══	46.4
9.	N.	36°¾	E.	19.20	═══	76.8
10.	N.	22°⅓	E.	14.00	═══	56.0
11.	S.	76°¾	E.	12.00	═══	48.0
12.	S.	15°	W.	10.85	═══	43.4
13.	S.	16°¾	W.	10.12	═══	40.48
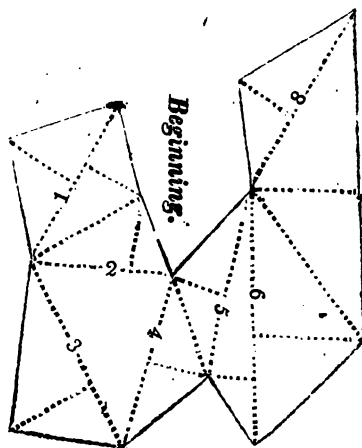
	Bases.	Perpen.	Double Area.
1.	75.4 }	33.5 } 29.9 }	4787.90
2.	59.0	35.	2065.00
3.	90.0 }	49.3 } 40.0 }	8037.00
4.	72.5	26.3	1906.75
5.	86.0	26.0	2236.00
6.	112.6 }	20.0 } 42.2 }	7003.72
7.	141.2	44.0	6212.80
8.	85.6	27.5	2354.00

$\frac{1}{2}$)34603.17

4,0)1730,1.585

4) 432 21

Acres 108 0 21 Answ.

EXAMPLE 4.

Required to lay down a Map of 20 Perches to an inch, from the following Notes, and find the Area.

				Ch.		Perches.
1.	S.	62°	W.	7.57	=	30.28
2.	N.	23°½	W.	5.89	=	23.56
3.	North			5.82	=	23.28
4.	N.	33°½	W.	8.83	=	35.32
5.	N.	48	E.	4.81	=	19.24
6.	N.	12	E.	4.66	=	18.64
7.	N.	62°½	E.	5.27	=	21.08
8.	S.	6°½	E.	5.60	=	22.40
9.	S.	40°½	E.	5.87	=	23.48
10.	East			6.54	=	26.16
11.	North			5.52	=	22.08
12.	N.	68°¼	E.	3.10	=	12.40
13.	S.	30°	E.	7.90	=	31.60
14.	S.	23°	W.	8.80	=	35.20
15.	S.	31°½	E.	6.42	=	25.68
16.	S.	50°	W.	8.40	=	33.60
17.	N.	44°	W.	7.04	=	28.16

R 2

	Bases.		Perp.	Double Area.
No. 1.	24.6	}	17.9 } 17.6 }	873.30
2.	42.6		15.8	673.08
3.	52.0	}	21.0 } 22.2 }	2246.40
4.	43.4		8.5	368.90
5.	73.0	}	26.0 } 22.1 }	3511.30
6.	59.2	}	24.4 } 23.1 }	2812.00
7.	46.0	}	20.7 } 22.2 }	1973.40
8.	35.7		25.1	896.07
9.	35.2	}	17.0 } 11.0 }	985.60

$\frac{1}{2}$)14340.05

4|0) 717|0.02

4) 179 10

Acres 44 3 10 Answ.

A TABLE

OF THE

ANGLES WHICH EVERY POINT OF THE COMPASS

MAKES

WITH THE MERIDIAN.

North.	South.	Points.	D.M.	North.	South.
		$\frac{1}{4}$	2.49		
		$\frac{1}{2}$	5.37		
		$\frac{3}{4}$	8.26		
N. by E.	S. by E.	1	11.15	N. by W.	S. by W.
		1 $\frac{1}{4}$	14. 4		
		1 $\frac{1}{2}$	16.52		
		1 $\frac{3}{4}$	19.41		
N. N. E.	S. S. E.	2	22.30	N. N. W.	S. S. W.
		2 $\frac{1}{4}$	25.19		
		2 $\frac{1}{2}$	28. 7		
		2 $\frac{3}{4}$	30.56		
N. E. by N	S. E. by S.	3	33.45	N. W. by N	S W. by S.
		3 $\frac{1}{4}$	36.34		
		3 $\frac{1}{2}$	39.22		
		3 $\frac{3}{4}$	42.11		
N. E.	S. E.	4	45. 0	N. W.	S. W.
		4 $\frac{1}{4}$	47.49		
		4 $\frac{1}{2}$	50 37		
		4 $\frac{3}{4}$	53.26		
N. E. by E	S. E. by E.	5	56.15	N. W. by W.	S. W. by W.
		5 $\frac{1}{4}$	59. 4		
		5 $\frac{1}{2}$	61.52		
		5 $\frac{3}{4}$	64 41		
E. N. E.	E. S. E.	6	67.30	W. N. W.	W. S. W.
		6 $\frac{1}{4}$	70.19		
		6 $\frac{1}{2}$	73. 7		
		6 $\frac{3}{4}$	75.56		
E. by N.	E. by S.	7	78.45	W. by N.	W. by S.
		7 $\frac{1}{4}$	81.34		
		7 $\frac{1}{2}$	84.22		
		7 $\frac{3}{4}$	87.11		
	East.	8	90. 0	West.	

TO FIND THE

CONTENT OF LAND,

BY

CALCULATION.

THE foregoing method of dividing a map into Triangles and Trapeziums, although it appears to be demonstrably true in theory, it is not to be depended on in practice, where accuracy is required; for a map may be so divided several ways, and will generally give as many different areas; therefore I shall not enlarge upon it here, but proceed to shew how the true Area may be found, by difference of latitude and departure.

DEFINITIONS.

1. Meridians are North and South lines supposed to pass through every station, parallel to each other.

2. The difference of Latitude, or Northing or Southing of any line, is the distance that one end of the line is North or South from the other—Thus in the following figure

S
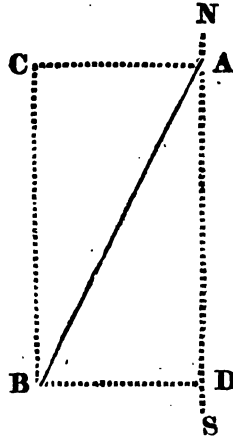
Suppose NS to be a meridian line, passing through the point A, of the line AB; then is AD the difference of latitude or southing of the line AB.

3. The Departure of any line, is the nearest distance from one end of a line to a meridian passing through the other end; thus DB is the Departure or Westing of the line AB.

Reverse this line, and call it BA; then will BC be the Difference of Latitude or Northing of the line BA, and CA the Departure or Easting of the same line.

4. That meridian which passes through the first station, is called the first meridian.

The meridian distance of any line, is the distance thereof from the last meridian.

POSITION.

In every survey, which is truly taken, the sums of the
Northings and Southings will be equal; and the sums of
the Eastings and Westings will be equal.

For, if I depart from any place, suppose A, in the an-
nexed figures, it is evident, that when I return to the same
spot, I must have made as much Northing as Southing, and
Easting as Westing, let my traverse be ever so irregular.
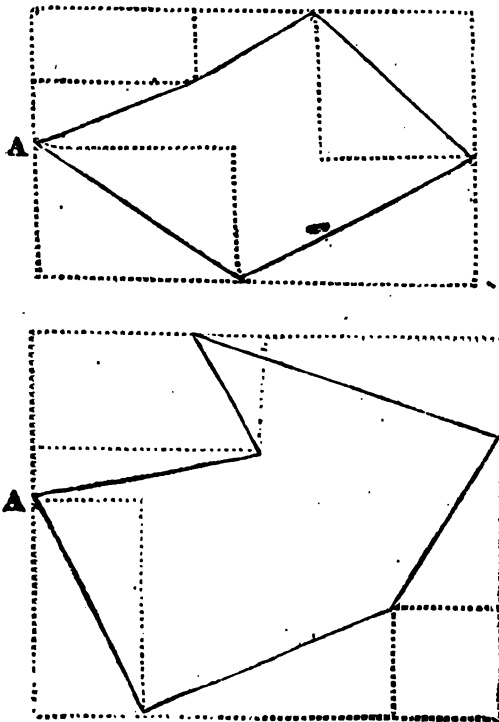
To take out of the Tables of Latitude and Departure, the Difference of Latitude and Departure, answering to any Course and Distance.

RULE.

If the integral number exceeds not 100, it is found in the right and left hand columns marked, *Dist.* And if the degrees be less than 45, they are found at the top of the page; and in the columns marked *Lat.* and *Dep.* is the latitude and departure answering thereto; but if the degrees exceed 45, they are found at the bottom of the page, and the latitude and departure in the columns so marked at the bottom. Then, opposite to the given distance, and under, or over the given degrees, will be the Latitude and Departure required. And if a decimal number be annexed, proceed with it as if a whole number, only observe, in taking out the difference of Latitude and Departure, to move the decimal point as many figures to the left, as are in the given decimal: and these last numbers, added to the former, will be those sought; but if the distance exceeds 100, it must be taken out at two or more times, and the results added together.

EXAMPLES.

Suppose the course to be N. 34° ½ E. and distance 14.64 chains.

	Lat.	Dep.
Opposite to 14, and under 34° ½, I find	11.54	7.93
Opposite to 64, and under the same degrees, moving the decimal point two figures to the left, I find	00.52	0.36
Gives the number sought	12.06	8.29

Bearing S. 53° ¼ W. Distance 26.17 chains.

	Lat.	Dep.
Opposite to 26, and over 53° ¼, I find	15.56	20.83
Opposite to 17, moving the point two figures to the left, I find }	00.10	00.14
The numbers required,	15.66	20.97

Bearing, N. 28° ¾ W. Distance, 146.8 perches.

	Lat.	Dep.
Opposite to 100, and under 28° ¾, I find	87.67	48.10
Opposite to 46, in the same columns, I find }	40.33	22.13
Opposite to 8, moving the point one figure to the left hand, }	00.70	00.38
Give, as required,	128.70	70.61

If the given distance be less than 10, and only one decimal figure, then the difference of latitude and departure may be taken at one view, by finding the two figures in the side column, as if they were a whole number; and in taking out the latitude and departure, move the decimal point one figure to the left.

Suppose the bearing to be S. 18° ¾ E. Distance 7.40 chains.

	Lat.	Dep.
Opposite to 74, and under 18° ¾, moving the point one figure to the left, I find }	7.00	2.37

Thus proceed with every course and distance in the survey, and place the numbers in their respective columns, in tables ruled for that purpose, as in the Examples following. Then add up each column, and if they balance, as mentioned in the preceding position, the work is right.

But in real practice, it but rarely happens, that the columns of latitude and those of departure, will balance on first being added up, for little inaccuracies will arise, both in taking the observations, and in chaining; to adjust which, *Observe*,

That in small surveys, if the difference amounts to 5 links for every station, there must have been some error committed in taking the survey; and the best way to rectify it, will be by a re-survey on the ground, or at least so much of it as will discover the error. But if the differences be within these limits, the work may be balanced, by adding one half of the differences to the numbers in the less columns, and subtracting it from those in the greater, in such a manner, that the numbers may be altered nearly in proportion to their corresponding distances, as in the following example.

EXAMPLE.

No.	Field Notes Courses	Chains	From the Tables N. L	S. L	E. D	W. D	Balanced N. L	S. L	E. D	W. D
1	S. 40 W.	17.50		13.40		11.25		13.40		11.25
2	N. 45 W.	22.25	15.74			15.74	15.73			15.75
3	N. 36 E.	31.25	25.28		18.37		25.27		18.36	
4	North.	13.60	13.60				13.60			
5	S. 81 E.	46.50		7.27	45.92			7.28	45.91	
6	S. 8 W.	34.25		33.91		4.76		33.92		4.77
7	West.	32.50				32.50				32.50
			54.62	54.58	64.29	64.25	54.60	54.60	64.27	64.27
			54.58		64.25					
		Diff.	(2/3)4		(2/3)4					
		Diff.	9 1/3		9					

Having found the difference of latitude and departure to every course and distance, and balanced the columns, if necessary, then find the meridian distances, by choosing such a place in the columns of Eastings or Westings, as will admit of a continual double addition of the one, and subtraction of the other; and this will end in 0, 0, or a cipher, if the additions and subtractions be right; because there is just as much added as subtracted, which will become easy and familiar by a little practice, and instruction from the teacher.

Then multiply each upper meridian distance into its respective Northing or Southing, and place the products in their respective columns of North or South area, and half the difference between the sums of these columns will be the area of the map, in such measure as the distances were taken in.   As exemplified in the following examples.

I shall now proceed to find, by calculation, the area of each of the preceding surveys.

Note. In the following example, the columns of difference of latitude and departure, will not balance on first adding up.

Example 1.

No	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.	E.M.D	N. Area	S. Area
1	N.43°¾E.	10.51	7.58		7.26		7.26 / 14.52	55.0308	
2	S.54¼E.	14.20		8.26	11.55		26.07 / 37.62		215.3382
3	S.49¾W.	13.45		8.74		10.24	27.38 / 17.14		239.3012
4	N.42¼W.	12.75	9.42			8.57	8.57 / 0.00	80.7294	
			17.00	17.00	18.81	18.81		135.7602	454.6394

Area. 15A. 3R. 36P.

A. 15)9.4396
3)318.8792
135.7602

R. 3)77584
4
P. 36)03360
40

Proved by making West Meridian Distance.

No	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.	WMD	N. Area	S. Area.
1	N.43°¾E.	10.51	7.58		7.26		30.36 / 23.16	230.1288	
2	S.54½E.	14.20		8.26	11.55		11.55 / 00.00		95.4030
3	S.49½W.	13.45		8.74		10.24	10.24 / 20.48		89.4976
4	N.42¼W.	12.75	9.42			8.57	29.05 / 37.62	273.6510	

503.7798 184.9006
184.9006

½)318.8792

A. R. P.

The same as before.   159.4396=15 3 39

Map of the preceding Calculation.

DEMONSTRATION.

Ab or DC, is the east departure of the first distance
AO; and AD or bC the north difference of latitude, gh

T

the east departure of the second distance Ch; and Cg = DE, the south difference of latitude, PO the west departure of the third distance hO, and VO = EF the south difference of latitude, OF the west departure of the last distance OA, and FA the north difference of latitude; and AD × DC=the area of AbCD, and DC + DC + gh= DG = EI, and EI × DE = the area of EIGD; and EI + gh = EK, and EK — PO = EL = FT, and FT × FE = the area of FTLE, and FT — PO = OF = FO, and FO × FA = the area of FOrA.

It is sufficiently clear, that the south areas take in those of the north, and that the sum of the north areas is equal to the sum of the parallelograms BGIh, and hLTP ; therefore the sum of the north areas taken from that of the south, leaves the area of the parallelogram DBPF, which is double the area of the map. For (by Positions 2 and 3) a triangle is equal to half a right angled parallelogram, made by the base and perpendicular height of the triangle; so, also, must a trapezium be equal to half a right angled parallelogram, made by the base, and height of the sum of the two perpendiculars.

Now, if a line be drawn from the point A to h, and from the points C and O, let fall perpendiculars on that line or base, then the map is a Trapezium (see the same figure 120) and the parallelogram DBPF, equal to the two parallelograms made on the base Ah, one of them being the height of a perpendicular from C, and the other of one from O. The same demonstration will hold good on like principles, where the Meridian distance is West, and the South areas taken from those of the North, leave the double area of the map. And the same of any map or survey.

EXAMPLE 2.

N.	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.	E.M.D.	N. Area.	S. Area.
1	S. 40° W.	17.50		13.40		11.25	$\frac{42.75}{31.50}$		572.500
2	N. 45 W.	22.25	15.73			15.75	$\frac{15.75}{00.00}$	247.7475	
3	N. 36 E.	31.25	25.27		18.36		$\frac{18.36}{36.72}$	463.9572	
4	North.	13.60	13.60				36.72	499.3920	
5	S. 81 E.	46.50		7.28	45.91		$\frac{82.63}{128.54}$		601.5464
6	S. 8 W.	34.25		33.92		4.77	$\frac{123.77}{119.00}$		4198.2784
7	West.	32.50				32.50	$\frac{86.50}{54.00}$		

```
                    54.60   54.60   64.27   64.27         1211.0967 5372.6748
                                                                    1211.0967
                                                          ½)416,1.5781
                                                          A. 208,0.78905
                                                                          4
                                                          R.  ,315620
                                                                         40
        Area 208A. 0R. 12.6248P.  As before.             P.  12,624800
```

Proceed by making West Meridian Distance.

N.	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.	W. M. D.	N. Area.	S. Area.
1	S. 40° W.	17.50		13.40		11.25	85.79 / 97.04		1149.5860
2	N. 45 W.	22.25	15.73			15.75	112.79 / 128.54	1774.1867	
3	N. 36 E.	31.25	25.27		18.36		110.18 / 91.82	2784.2486	
4	North.	13.60	13.60				91.82	1248.7520	
5	S. 81 E.	46.50		7.28	45.91		45.91 / 00.00		334.2248
6	S. 8 W.	34.25		33.92		4.77	4.77 / 9.54		161.7984
7	West.	32.50				32.50	73.54 / 73.04		
			54.60	54.60	64.27	64.27	5807.1873 / 1645.6092		1645.6092

$$2)4161.5781$$
A. 208,078905
4
,315620
40
P. 12.624800

Area 208 A. OR. 12.6248 P. The same as before.

To make a Map, from Difference of Latitude and Departure.

RULE.

1. Draw a meridian line as NS, and assume a point therein, for the first station, as 1, through which draw a line perpendicular thereto both ways, as WE.

2. Lay the difference of latitude of the first distance, from said point, on the meridian, upward, if North, and downward, if South, as from A to 1; and that of the second, from 1 to 2; and the third from 2 to 3, &c. If the last coincide with the first, it denotes its rectitude. In like manner lay the departures on the line WE, towards the right hand, if East, and towards the left, if West, as from A to 1, from 1 to 2, from 2 to 3, &c. as in the annexed figure.

3. With the distance from A to 1, on the line NS, and one foot in 1, on the line WE, describe an arch upward, if North, and downward, if South, as at B, and with the distance from A to 1, on the line WE, and one foot in 1, on the line NS, cross the said arch in B, the place of the second station; and so for the 2d, 3d, 4th, &c. which joined with lines, will complete the map.

Map of the preceding Calculation.
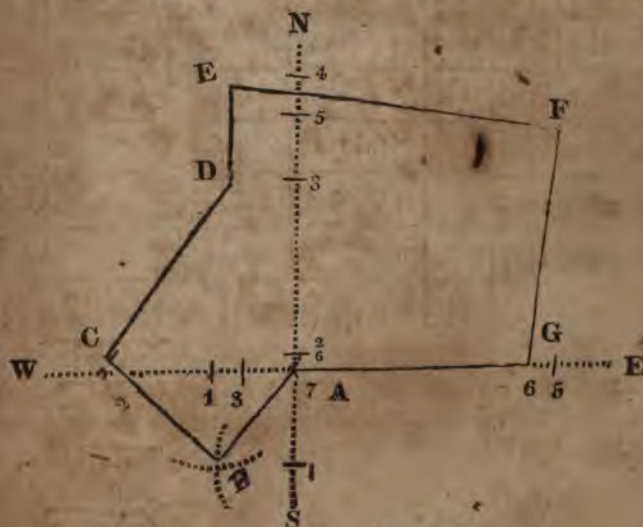
EXAMPLE 3.

West Meridian Distance.

N.	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.	WM.D	N. Area.	S. Area.
1	N. 75 E.	13.70	3.54		13.24		52.84 / 39.60	187.0536	
2	N. 20½ E.	10.30	9.65		3.60		36.00 / 32.40	347.4000	
3	East.	16.20			16.20		16.20 / 00.00		
4	S. 33¼ W.	35.30		29.44		19.49	19.49 / 38.98		573.7856
5	S. 76 W.	16.00		3.87		15.52	54.50 / 70.02		210.9150
6	North.	9.00	9.00				70.02	630.1800	
7	S. 84 W.	11.60		1.20		11.54	81.56 / 93.10		97.8720
8	N.53¼ W.	11.60	6.93			9.29	102.39 / 111.68	709.5627	
9	N.36¾ E.	19.20	15.38		11.48		100.20 / 88.72	1541.0760	
10	N. 22½ E.	14.00	12.93		5.36		83.36 / 78.00	1077.8448	
11	S. 76¾ E.	12.00		2.75	11.68		66.32 / 54.64		182.3800
12	S. 15 W.	10.85		10.48		2.81	57.45 / 60.26		602.0760
13	S. 16¾ W.	10.12		9.69		2.91	63.17 / 66.08		612.1173
			57.43	57.43	61.56	61.56		4493.1171 / 2279.1459	2279.1459

½) 2213.9712

A. 110,69856
4

R. 2,79424
40

P. 31,76960

A.   R.   P.
Area 110 : 2 : 82 nearly.

THE EXAMPLE,

By East Meridian Distance.

N.	Bearings.	Dist.	N. L.	S. S.	E. D.	W. D.	E.M D	N. Area.	S. Area.
1	N. 75 E.	13.70	3.54		13.24		58.84 / 72.08	208.2936	
2	N.20½ E.	10.30	9.65		3.60		75.68 / 79.28	730.3120	
3	East.	16.20			16.20		95.48 / 111.68		
4	S.33½ W	35.30		29.44		19.49	92.19 / 72.70		2714.0736
5	S. 76 W.	16.00		3.87		15.52	57.18 / 41.66		221.2866
6	North.	9.00	9.00				41.65	374.9400	
7	S 84 W.	11.60		1.20		11.54	30.12 / 18.58		36.1440
8	N.53¾ W	11.60	6.93			9.29	9.29 / 0.00	64.3797	
9	N.36¾ E.	19.20	15.38		11.48		11.48 / 22.96	176.5624	
10	N.22½ E.	14.00	12.93		5.36		28.32 / 33.68	366.1776	
11	S. 76¾ E.	12.00		2.75	11.68		45.36 / 57.04		124.7480
12	S. 15 W.	10.85		10.48		2.81	54.23 / 51.42		568.3304
13	S. 16¾ W	10.12		9.69		2.91	48.51 / 45.60		470.0619
			57.43	57.43	61.56	61.56		1920.6658	4134.6365
									1920.6653

½)2213.9712

A. 110,6.9856
4

R. 2,79424
40

P. 31,76960

A. R. P.
Area 110 : 2 : 32 nearly.

EXAMPLE 4.

West Meridian Distance.

N	Bearings	D C	N.L.	S.L.	E. D.	W. D.	WMD	N.Area.	S. Area.
1	S. 62 W.	7.57		3.56		6.68	29.50 / 36.18		105 0200
2	N 43½W	5.89	4.27			4.05	40.23 / 44.28	171.7821	
3	North.	5.82	5 82				44.28	257.7096	
4	N 33⅓W	8.83	7.36			4.88	49.16 / 54.04	361.8176	
5	N 48 E	4.81	3.22		3.57		50.47 / 46.90	162.5134	
6	N 12 E	4.66	4.55		0.96		45.94 / 44.98	209 0270	
7	N 62½E.	5.27	2.43		4 68		40.30 / 35.62	97.9290	
8	S ½E	5.60		5.56	0.63		34.99 / 34.36		194.5444
9	S 40½E	5.87		4.46	3.81		30.55 / 26.74		136.2530
10	East.	6.54			6.54		20.20 / 13.66		
11	North.	5.52	5.52				13. 66	75.4032	
12	N68¼E	3.10	1.15		2.38		10.78 / 7.90	12.3970	
13	S 50 E.	7.90		6.84	3.95		3.95 / 0.00		27.0180
14	S 23 W	8.80		8 10		3.44	3.44 / 6.88		27.8640
15	S 31½ E.	6.42		5.47	3.35		3.53 / 0.18		19.3091
16	S 50 W	8.40		5.40		6.43	6.61 / 13.04		35.?940
17	N 44 W	7.04	5.07			4.89	17.93 / 22.82	90.9051	
			39.39	39.39	30.37	30.37		1439.4840	545.7025

545 7025

½)893.7815

A. 44,689075
    4

R. 2,756300
    40

P. 30,252000

A. R. P.
Area 44 : 2 : 30.25

The same Example calculated with East Meridian Distance.

N	Bearings.	D C	N. L.	S. L.	E. D.	W. D.	EMD.	N. Area.	S. Area.
1	S. 62 W.	7.57		3.56		6.68	24.54 / 17.86		87.3624
2	N 43⅓ W	5.89	4.27			4.05	13.81 / 9.76	58.9687	
3	North.	5.82	5.82				9.76	56.8022	
4	N 33⅓ W	8.83	7.36			4.88	4.88 / 0.00	35.9168	
5	N 48 E.	4.81	3.22		3.57		3.57 / 7.14	11.4954	
6	N 12 E	4.66	4.55		0.96		8.10 / 9.06	36.8550	
7	N 63⅓ E.	5.27	2.43		4.68		13.74 / 18.42	33.3882	
8	S 6⅓ E	5.60		5.56	0.63		19.05 / 19.68		105.9180
9	S 40½ E.	5.87		4.46	3.81		23.40 / 27.30		104.7654
10	East.	6.54			6.54		33.84 / 40.38		
11	North.	5.52	5.52				40.38	222.8976	
12	N68 ½E	3.10	1.15		2.88		43.26 / 46.14	49.7490	
13	S 30 E.	7.90		6.84	3.95		50.09 / 54.04		342.6156
14	S 23 W	8.80		8 10		3.44	50.60 / 47.16		409.8600
15	S 31½ E.	6.42		5.47	3.35		50.51 / 53.86		276.2897
16	S 50 W	8.40		5.40		6.43	47.43 / 41.00		256.1220
17	N 44 W	7.04	5.07			4.89	36.11 / 31.22	185.0777	
			39.39	39.39	30.37	30.37		689.1516	1582.9331
									689 1516

2)3893.7815

A. R. P.
Area 44 : 2 : 30.252

A. 44,689075
4

R. 2,756300
40

P. 30,252000

U

EXAMPLE 5.

This example has an inaccessible boundary, occasioned by the points of a lake projecting into the land, between the 3d and 4th corners; to survey which I take the Field Notes as follows, and in perches, as some surveyors are in the practice of so calculating their surveys.

			Per.
1.		North.	37.9
2.		N. 85 E.	36.0
3.	⎧ 3.	S. 25 W.	25.0 ⎫
	⎨ 4.	S. 2 E.	35.0 ⎬
	⎩ 5.	S. 26 E.	20.0 ⎭
4.	6.	S. 85 W.	60.0
5.	7.	N. 3 W.	40.0
6.	8.	East.	26.8

Take the difference of latitude and departure, for the three devious courses and distances, and what they want of balancing, will be the difference of latitude and departure for the distance from the 3d to the 4th corners, with which find the bearing and distance, as under specified.

No	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
3	S. 25 W.	25.0		22.7		10.6
4	S. 2 E.	35.0		35.0	1.2	
5	S. 26 E.	20.0		18.0	8.8	
	N. E.		75.7		0.6	
			75.7	75.7	10.6	10.6

Note. When calculations are made in perches, it is usual to retain but one decimal figure: and when the second is more that five, to increase the first one more.

To find the bearing from the 3d to the 4th corner.

As difference of latitude 3a   75.7P.   1.87910

Is to radius 90°   10.00000

So is departure 4a   0.6P.   9.77815

9.77815

1.87910

To Tangent bearing 0° 27'   7.89905

From the 4th to the 3d corner, N. 0° 27' E.

From the 3d to the 4th corner, S. 0° 27' W.

To find the distance from 3d to 4th corner.

As radius 90°   10.00000

Is to difference of latitude 3a 75.7   1.87910

So is secant bearing 0.27   10.00001

11.87911

10.00000

To the distance 75.7   1.87911

The Traverse will now stand as in the following page.

No	Bearings.	D. P.	N. L.	S. L.	E. D.	W. D.
1	North.	37.9	37.9			
2	N. 85° E.	36.0	3.1		35.7	
3	S. 27' W.	75.7		75.7		0.6
4	S. 85 W.	60.0		5.2		59.8
5	N. 3 W.	40.0	39.9			2.1
6	East.	26.8			26.8	
			80.9	80.9	62.5	62.5

Area 22A. 3R. 38.91 P.

Note. The calculation is omitted, to exercise the learner.
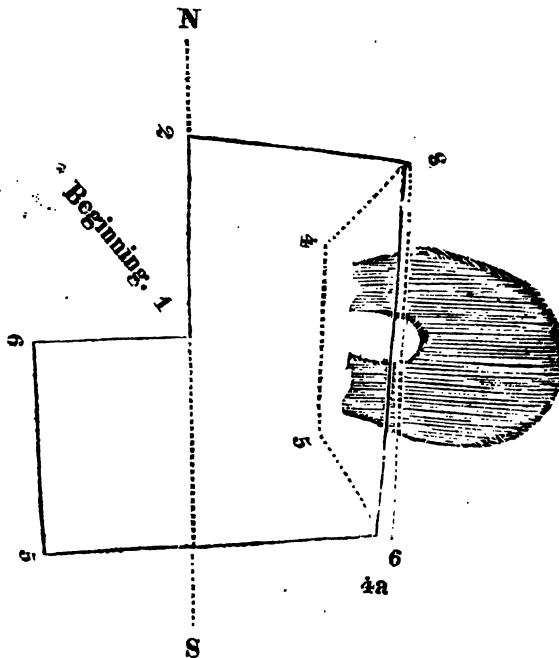
EXAMPLE 6.

In the following survey, the last course and distance is omitted to be taken; but it is required to be found, and also the area of the land inclosed.

RULE.

Find the difference of latitude and departure as before, for the several courses and distances taken, and what they want of balancing, will be those of the closing line, which find by Case 6 and 7, Right Angled Trigonometry.

Stations.	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.
AB	N. 60 W.	9.72	4.86			8.41
BC	N. 17 ¼ E.	7.65	7.31		2.27	
CD	N. 15 ¾ W.	9.40	9.04			2.55
DE	N. 63 ¾ E.	10.43	4.61		9.35	
EF	S. 49 E.	8.12		5.33	6.13	
FG	S. 13 ½ E.	8.45		8.22	1.97	
GH	S. 16 ¾ E.	6.44		6.17	1.86	
HA	S. 60.07 W.	12.24		6.10		10.62

Area 33A. 2R. 1.6056P.

To find the bearing.

As difference of latitude Ha.   6.10   0.78533
Is to radius 90   10.00000
So is departure Aa 10.62.   1.02612

                                11.02612
                                0.78533

To tangent bearing HA 60° 07'   10.24079

To find the Distance.

As radius 90°		10.00000
Is to difference of latitude Ha	6.10	0.78533
So is secant bearing 60° 07'		10.30256
		11.08789
		10.00000
To the distance HA 12.24		1.08789

Note. Observe the above proportion, in finding the bearing and distance
of all lines required, as above

THE MAP.
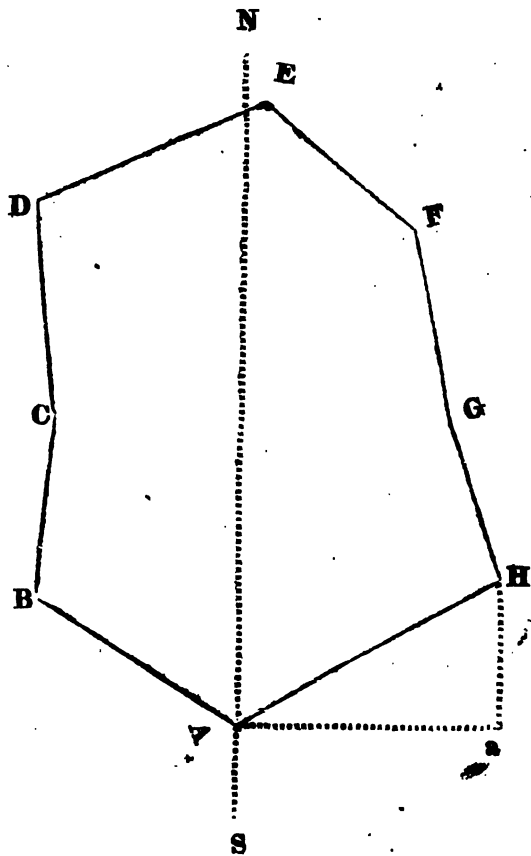
EXAMPLE 7.

In the following survey, the corner at A is inaccessible, occasioned by the overflowing of water; but it being a tree, it can be seen from the adjacent corners B and L; I therefore set my instrument at B, and take the bearing to A, which I find to be S. 51° ¼ E.   This I reverse, and place it as the first bearing in my field book, viz. N. 51° ¼ W. then proceed and take the several bearings and distances to L; and from L, I find the bearing to A is S. 20 ½ W. which I put for the last bearing in my field book, as under exemplified.

Stations.	Bearings.	D. Ch	N L.	S. L.	E. D.	W. D.
AB	N. 51 ¼ W.					
BC	S. 45 ½ W.	15.16		10.62		10.81
CD	N. 50 W.	22.10	14.20			16.93
DE	North.	18.83	18.83			
EF	N. 48 E.	22.60	15.12		16.79	
FG	N. 25 ½ W.	20.17	18.20			8.68
GH	East.	26.57			26.57	
HI	S. 30 ¼ E.	22.86		19.70	11.60	
IK	S. 44 W.	15.04		10.82		10.45
KL	S. 47 E.	28.55		19.47	20.88	
LA	S. 20 ½ W.					

The learner should set down all the work in full.

The difference of latitude and departure being found for the several courses and distances as above, and the columns added up, there will be wanting 5.74 south difference of latitude, and 28.97 west departure, to make the columns balance, as before directed, which are the difference of latitude and departure from L to B; with which, as in the foregoing example, the bearing of LB is found to be S. 78° 48' W. and distance 29.55 chains; then, in the triangle ABL, there are given the side LB, and by the bearings of the lines, the angles ABL 49° 57', ALB 58° 18', BAL 71° 45', to find the other sides; and by Case 1, Oblique Angled trigonometry, AB is found to be 26.47 chains, which set in its proper place, opposite its bearing, and the side LA 23.82 chains, which place opposite to its bearing; find the difference of latitude and departure to these distances, and proceed as before, to find the area of the survey, which is 244A. 3R.

(See the following figure.)

W
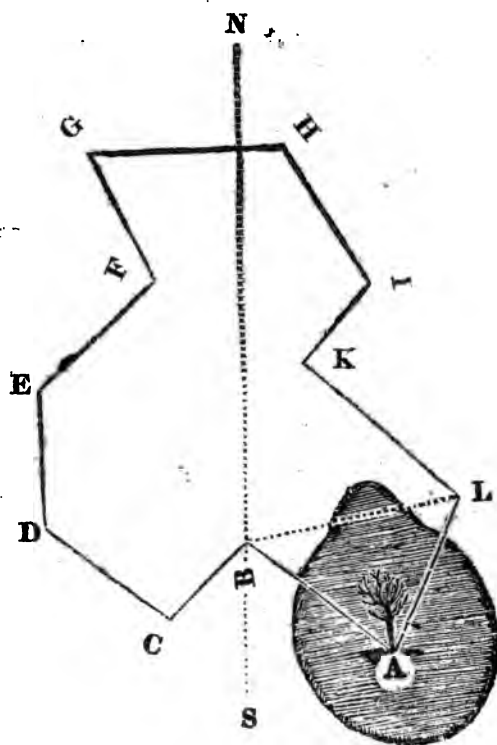
Specimens of the Pennsylvania method of Calculation; which, for simplicity and ease in finding the Meridian Distances, is supposed to be preferable in practice, to any thing heretofore published on the subject.

FIND in the first place, by the Traverse Table, the latitude and departure for the several courses and distances, as already taught; and if the survey be truly taken, the sums of the northings and southings will be equal, and also those of the eastings and westings. Then in the next place, find the meridian distances, by choosing such a place in the column of eastings or westings, as will admit of a continual addition of one, and subtraction of the other, by which means we avoid the inconvenience of changing the denomination of either of the departures.

The learner must not expect, that in real practice, the columns of latitude, and those of departure will exactly balance, when they are at first added up; for little inaccuracies will arise, both from the observations taken in the field and in chaining, which to adjust, previous to finding the meridian distances, we may observe, that if, in small surveys, the difference amount to two tenths of a perch for every station, there must have been some error committed in the field; and the best way in this case, will be to rectify it on the ground, by a re-survey, or at least as much as will discover the error; but when the differences are within those limits, the work may be balanced in the following manner; on a slate or separate piece of paper, find the latitude and departure to each

course and distance, as in the following example, observing to add an half of the differences to the numbers in the lesser column, and to subtract it from those of the greater, in such a manner, as that the numbers may be altered nearly in proportion to their corresponding distances.

EXAMPLE.

No	Courses	Per	F				B			
	Field Notes.		From the Tables.				Balanced.			
	Courses.	Per	N.	S.	E.	W.	N.	S.	E.	W.
1	S. 40 W.	70		53.6		45.0		5.36		45.0
2	N. 45 W.	89	62.9			62.9	63.0			62.9
3	N. 36 E.	125	101.1		73.5		101.2		73.5	
4	North.	54	54.0				54.0			
5	S. 81 W.	186		29.1	183.7			29.0	183.6	
6	S. 8 W.	137		135.7		19.1		135.0		19.2
7	West.	130				130.0				130.0

A. R. P.	218.0	218.4	257.2	257.0	218.2	218.2	257.1	257.1
207 3. 22.69		218.0	257.0					
Diff.		.4	.2					
½ Diff.		.2	.1					

The latitudes and departures being thus balanced, proceed to insert the meridian distances by the above method, where we will still make use of the same field-notes, only changing chains and links into perches and tenths of a perch. Then by looking along the column of departure, it is easy to observe, that in the columns of east-

ing, opposite station 9, all the eastings may be added, and the westings subtracted, without altering the denomination of either. Therefore, by placing 46.0, the east departure belonging to this station in the column of meridian distances, and proceeding to add the eastings and subtract the westings, according to the rule already mentioned, we shall find that at station 8, these distances will end in 0.0, or a cypher, if the additions and subtractions be rightly made; then multiplying the upper meridian distance of each station, by its respective northing or southing, the product will give the north or south area, as in the examples already insisted on, and which is fully exemplified in the annexed specimen. When these products are all made out, and placed in their respective columns, their difference will give double the area of the plot, or twice the number of acres contained in the survey. Divide this remainder by 2, and the quotient thence arising, by 160, the number of perches in an acre, then will this last quotient exhibit the number of acres and perches contained in the whole survey; which in this example, may be called 110 acres, 103 perches, 110 acres, 2 quarters, 23 perches.

Field-Notes of the two foregoing methods, as practised in Pennsylvania, cast up by Perches and tenths of a Perch.

N.	Courses	Dist.	N.	S.	E.	W.	M.D.	N. Area	S. Areas.
1	N. 75.00 E.	54.8	14.2		52.9		253.3 283.2	3341.26	
2	N. 20.30 E.	41.2	38.5		14.4		302.6 317.0	11680.36	
3	East	54.8			64.8		381.8 446.6		
4	S. 33.37 W.	14.15		117.7		77.9	368.7 290.8		43395.99
5	S. 76.00 W.	64.0		15.5		62.1	228.7 166.6		3544.35
6	North	36.0	36.0				166.6 166.6	59?7.60	
7	S. 84.00 W.	46.4		4.9		46.1	120.5 74.4		590.45
8	N. 53.15 W.	46.4	27.8			37.2	67.2 66.0	1664.16	
9	N. 36.45 E.	76.8	61.5		46.0		46.0 92.0	2829.00	
10	N. 22.30 E	56.0	51.7		21.4		113.4 134.8	5952.78	
11	S. 76.45 E.	48.0		11.0	46.7		181.5 228.2		1996.50
12	S. 15.00 W.	43.4		41?		11.2	217.0 205.8		9092.30
13	S. 16.45 W.	?.5		58.8		11.7	197.1 152.4		7531.08
			229,8 229,8	246,2 246,2			30745 16	66151.17 30745.16	

2 35406.01

Area in Perches 177 05.05

A piece of woodland belonging to Nic's Haliday, esq.
situated on the banks of the Delaware, in Pensboro'
Manor, Bucks County, surveyed by Isaac Hicks assisted
by T. Hamilton, November 21, 1798.

By the Pennsylvania Method.

Content of the above survey by the Pennsylvania method.

Courses.	Dist.	N.	S.	E.	W.	M. D	N. Area.	S. Area.
S. 51° W.	60.9		38.82		47.39	47 39 / 00.00		1815.98
S. 59 ¾ E.	18.		9.06	15.53		15.53 / 31.06		140.70
S. 74 ¾ E.	37.75		9.92	36.38		67.44 / 103.82		669.40
N. 47 ¾ E.	25.	16.82		18.43		122.25 / 140.68	2056.24	
N. 29 ½ W.	46.5	48			22.95	117.73 / 94.78	4765.71	
		57.30	57.30	70.34	70.34		6821.95 / 2625.78	2625.78

$$\tfrac{1}{2})4196.17$$
$$2625.78$$

$$4|0)209|8.085$$

$$4)52\quad 18$$

Acres 13　18.08 Ans.

A piece of ground in Lower Dublin Township, Phila-
delphia County, belonging to George Vandergrift.

Pennsylvania Method.
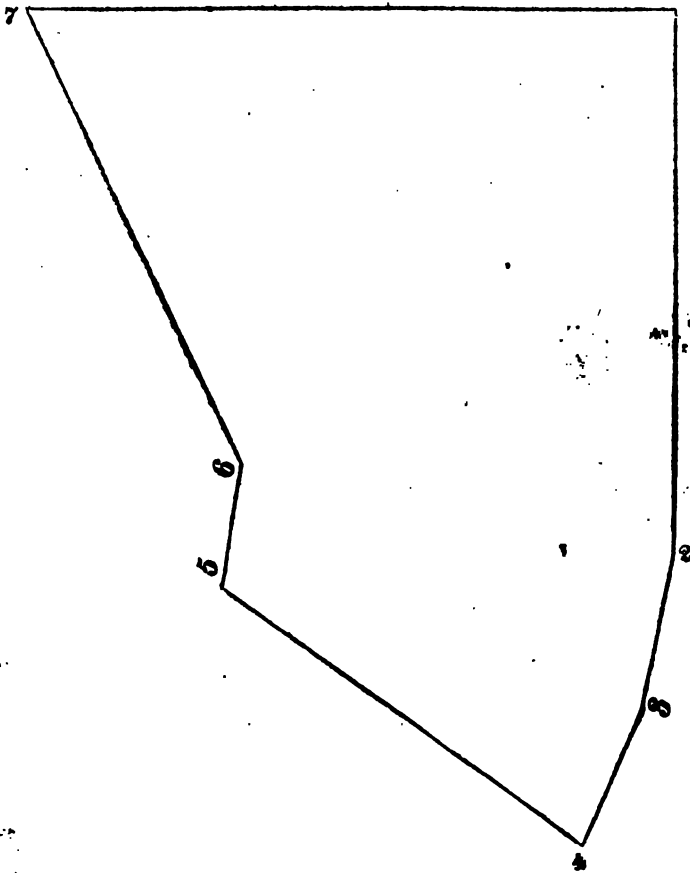
Courses.	Dist.	N.	S.	E	W.	M.D.	N.Areas	S. Area
S. 47° ¼ W.	28.5		19.34		20.85	356.7 135.2		51.73
S. 61° ¼ W.	8.		3.85		7.01	28.37 21.50		104.34
K. 71° ¼ W.	8.		2.54		7.59	13.71 6.12		54.13
N. 7° ¼ W.	23.5	23.29			3.06	3.06 0.00	71.26	
N. 59° E.	0.9	3.65		5.85		5.85 11.70	21.35	
N. 22° ¼ E.	26.	24.06		9.84		21.54 31.38	518.25	
43° E.	34		25.27	22.82		54.20 77.02		1369.63
		57.00	51.00	38.51	38.51		610.86	2599.75 610.86

$$\tfrac{1}{2})1988.90$$

$$4|0)99|4.45$$

A. R. P.
0 0 34 Content.

$$4)34.34.25$$

6A. 34R.

OFF-SETS.

OFF-SETS are perpendiculars measured from the angular points of the land, to the stationray distance on either side thereof; to do which, observe the following

RULE.

Rule a table, as hereafter exemplified; take the bearing of the line from which off-sets are to be made, and from this line make off-sets at right angles to each angular point on either side; set the distance to each offset under the head of Base, and the distance of each offset, under that of Perpendicular.

Then, to find the area of these off-sets,

Set the firt base opposite to station 1, in the column headed Bases, and take the first base from the second, the second from the third, &c. and set the remainders, respectively, in said column; each of which will be the distance between the respective perpendiculars. Then add the first and second perpendiculars together, the second and third, third and fourth, &c. and set their sums respectively, in the column marked Sum of Perpendiculars. Then each of these numbers, multiplied in its respective base, will give the double area of the quadrilateral figure, and triangle, (by Problems 6 and 9, pages 107 and 110.

EXAMPLE 1.

Let A B C D E F G H, be the boundary of a field, by which it is required to lay off a field containing 85A. 3R. 20P. in form of an oblong, by a line parallel to AI.

A   13.90 Chains.   K

46 Chains.

H   I   13.90 Chains.   L
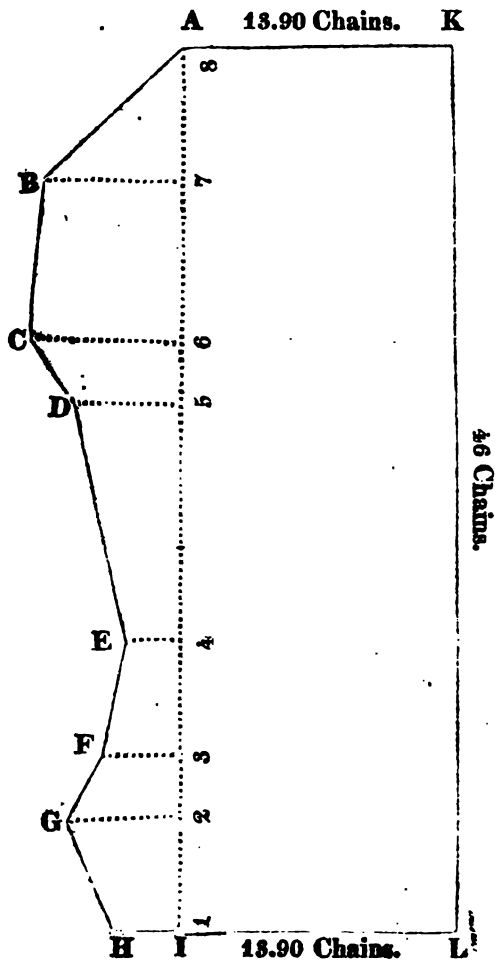
No.	Base. Ch.	Perp. Ch.	Bases.	Sum of Perpen	Double Area.
1	0.00	3.60	6.20	9.60	59.52
2	6.20	6.00	2.80	10.00	28.00
3	9.00	4.00	6.00	6.50	39.00
4	15.00	2.50	12.80	7.80	99.84
5	27.80	5.30	2.70	13.30	35.91
6	30.50	8.00	8.50	15.00	127.50
7	39.00	7.00	7.00	7.00	49.00
8	46.00	0.00			

$\frac{1}{2}$)438.77 Sum.

A. 21,9385

4

R. 3,7540

40

P. 30,1600

• Area 21A. 3R. 30P.

```
        A.  R.  P.
From   85   3   20
Take   21   3   30  Area of the off-sets.

Remains 63  3   30  To be laid off.
   40)30
     4)3.75
     639.375  Square Chains.
```

By Problem 4, page 105, divide thus :

46)639.375(13.90 ch. nearly, from A and I to K and L.

EXAMPLE 5.

Suppose a meadow bounded on a brook, as under specified, the area of which is required:

Note. The 1st perpendicular is set opposite the 1st base, because they form a triangle.

Measured in Perches.

N.	B.	P.	Bs	S.P.	D. A.
1	0.0	0.0	2.0	5.0	10.00
2	2.0	5.0	0.5	9.0	4.50
3	2.5	4.0	1.5	5.2	7.80
4	4.0	1.2	1.0	2.4	2.40
5	5.0	1.2	0.5	2.6	1.30
6	5.5	1.4	1.5	6.5	9.75
7	7.0	5.1	1.0	10.5	10.50
8	8.0	5.4	1.5	10.7	16.05
9	9.5	5.3	0.0	7.5	00.00
10	9.5	2.2	1.9	3.4	6.46
11	11.4	1.2	1.6	2.6	4.16
12	13.0	1.4	1.0	6.4	6.40
13	14.0	5.0	2.0	10.0	20.00
14	16.0	5.0	2.2	9.2	20.24
15	18.2	4.2	2.0	5.3	10.60
16	20.2	1.1	1.8	2.2	3.96
17	22.0	1.1	1.0	5.1	5.10
18	23.0	4.0	2.0	8.0	16.00
19	25.0	4.0	1.0	7.0	7.00
20	26.0	3.0	0.3	3.0	0.90
21	26.3	0.0	5.7	3.0	17.10
22	32.0	3.0			

N.	B.	P.	Bs	S.P.	D. A.
1	0.0	0.0	1.4	0.8	1.12
2	1.4	0.8	1.4	1.7	2.38
3	2.8	0.9	.3	0.9	0.27
4	3.1	0.0	0.0	0.0	0.00

½)3.77

1.88

½)180.22

90.11
01.88

Area of the off-sets. 91.99
oblong. 355.2

4,0)44,7.19

4)11.7 P.

Note. The perpendicular opposite the 9th station, extends to the extreme point; and that opposite the 10th, to the nearest point. The offsets on the 9th station are as above.

12.8 }
9.4 }

22.2

Area 2A. 3R. 7P. Ans.   32.

½) 710.4

355.2

EXAMPLE 3.

With off-sets on the 2d. 4th. and 5th. boundaries.

No	Bearings.	Dis. Ch.	N. L.	S. L.	E. D.	W. D.
1	N. 36 ¾ W.	30.00	24.04			17.95
2	N. 56 ¼ E.	21.60	12.00		17.96	
3	N. 26 ½ E.	13.44	12.01		6.00	
4	S. 71 ½ E.	18.96		6.02	17.98	
5	S. 26 ½ E.	13.46		12.04	6.00	
6	S. 45 W.	42.41		29.99		29.99
			48.05	48.05	47.94	47.94

Area 1152.20855 Square chains.
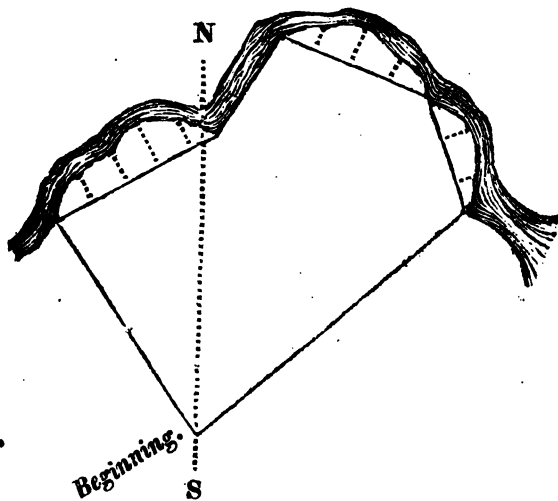
	No	Base.	Perp.	Bases	Sum of Pe.	Double Area.
2d. Boundary.	1	0.00	0.00	6.10	3.10	18.9100
	2	6.10	3.10	4.05	5.45	22.0725
	3	10.15	2.35	3.93	5.21	20.4753
	4	14.08	2.86	5.12	5.06	25.9072
	5	19.20	2.20	2.40	2.20	5.2800
	6	21.60	0.00	0.00	0.00	0.0000
4th. Boundary.	1	0.00	0.00	4.20	2.10	8.8200
	2	4.20	2.10	3.85	3.40	13.0900
	3	8.05	1.30	7.10	3.25	23.0750
	4	15.15	1.95	3.81	1.95	7.4295
	5	18.96	0.00	0.00	0.00	0.0000
5th. Boundary.	1	0.00	0.00	5.12	2.05	10.4960
	2	5.12	2.05	4.88	3.30	16.1040
	3	10.00	1.25	3.46	1.25	4.3250
	4	13.46	0.00	0.00	0.00	0.0000

$\frac{1}{2}$)175.9845

Area of the off-sets   87.99225 S.Ch.
       Map,   1152.20855

A. 124,020080
            4

    ,080320
        40

124A. 0R. 3.212800P. Answer.

Y

OF OFF-SETS.

EXAMPLE 4.

Suppose a water-course to be the line between the lands of A and B, as under specified; which they agree to straiten by a line from the point C to D. Query, which must pay the other, and for how much land?

C

A's Land.

B's Land.

D
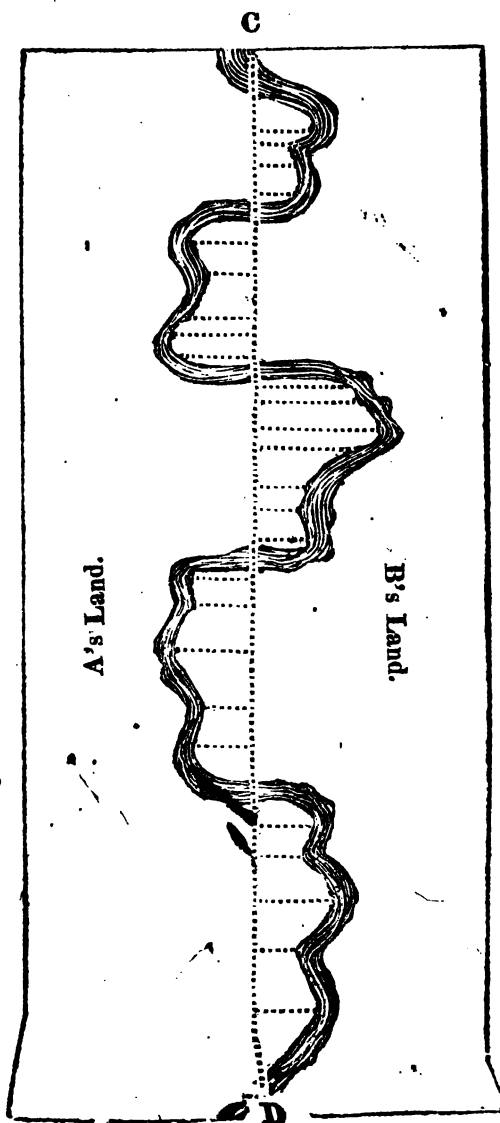
Off-sets on B to A.   Off-sets on A to B.

N	Base	Pr.	B's.	S.P	D. A.
1	0.00	0.00	1.86	4.14	7.7004
2	1.86	4.14	2.58	6.52	16.8216
3	4.44	2.38	1.67	5.24	8.7508
4	6.11	2.86	1.61	7.86	12.6546
5	7.72	5.00	1.58	8.70	13.7460
6	9.30	3.70	1.10	3.70	4.0700
7	10.40				

N	Base	Pr.	B's.	S.P	D. A.
1	0.00	0.00	0.82	3.79	3.1078
2	0.82	3.79	1.98	6.55	12.9690
3	2.80	2.76	3.25	7.56	24.5700
4	6.05	4.80	3.95	7.18	28.3610
5	10.00	2.38	2.82	6.19	17.4558
6	12.82	3.81	3.78	3.81	14.4018
7	16.60				

$\frac{1}{2}$)164.6088

82.3044

N	Base	Pr.	B's.	S.P.	D. A.
1	0.00	0.00	2.00	3.85	7.7000
2	2.00	3.85	0.50	6.81	3.4050
3	2.50	2.96	1.98	6.20	12.2760
4	4.48	3.24	1.46	6.56	9.5776
5	5.94	3.32	1.34	3.32	4.4488
6	7.28				

N	Base	Pr.	B's.	S.P.	D. A.
1	0.00	0.00	0.57	5.70	3.2490
2	0.57	5.70	1.16	12.03	13.9548
3	1.73	6.33	1.87	14.63	27.3581
4	3.60	8.30	1.67	15.12	25.2504
5	5.27	6.82	2.93	10.20	29.8860
6	8.20	3.58	1.00	5.98	5.9800
7	9.20	2.60	2.41	6.22	14.9902
8	11.61	3.62	2.84	3.62	10.2808
9	14.45				

N	Base	Pr.	B's.	S.P.	D. A.
1	0.00	0.00	2.50	4.13	10.3250
2	2.50	4.13	2.91	6.91	20.1081
3	5.41	2.78	3.15	7.98	25.1370
4	8.56	5.20	3.30	7.67	25.3110
5	11.86	2.47	4.34	6.37	27.6458
6	16.20	3.90	5.03	3.90	19.6170
7	21.23				

$\frac{1}{3}$)296.5006

148.2503
82.3044

A.6,59459
4

R.2,37836
40

6A. 2R. 15,13440P.

Answ. B must pay A for 6A. 2R. 15,1344P.

Note. The measures are taken in chains and links.

DIVISION OF LAND.

PROBLEM I.

To cut off from a triangle any part thereof, by a line issuing from an angular point to the opposite side of the triangle.

RULE.

As the area of the triangle,
Is to the side the division is to fall on ;
So is the part to be cut off,
To its proportion of that side,

EXAMPLE.

Admit the triangle ABC, to contain 650 square perches, and 290 of them is required to be cut off towards A, by a line issuing from the point C, on to the line AB, which is 40 perches long.

Sq. Pr. Pr. Sq. Pr.
As 650 .. 40 : : 290 .. 17.84 perches from A to D.
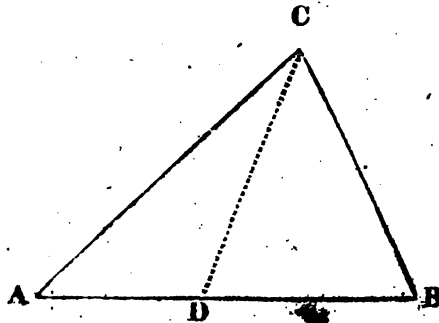
PROBLEM II.

To cut off from a Triangle, any Part thereof, by a Line running parallel to one of it's Sides.

RULE.

As the area of the triangle,
Is to the square of one side the division line is to be on;
So is the area of the part to be taken off,
To the square of its proportion of that side:
The square-root of which will be the length required.

EXAMPLE.

Suppose the triangle ABC to contain 500 square per-ches, and it is required to cut off 120 towards A, by a line parallel to BC; the line AB being 40 perches long, and AC 36.
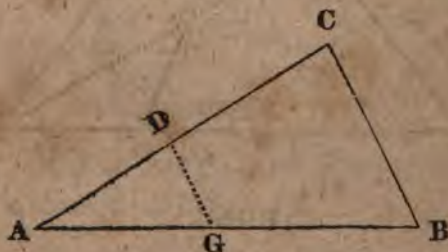
$40 \times 40 = 1600$, square of AB.

As 500 .. 1600 :: 120 .. $\sqrt{384} = 19.6$ nearly, the distance from A to G.

Then as $\begin{cases} AB .. AG :: AC .. AD. \\ 40 .. 19.6 :: 36 .. 17.64 \text{ Perches.} \end{cases}$

PROBLEM III.

To cut off from a Triangle, any Part thereof, by a Line issuing from a given Point in one of it's Sides.

EXAMPLE.

In the annexed triangle, containing 800 square perches AB is 50 perches long, and AC 40, and it is required to it off towards A, 500 square perches, by a line issuing a the point F 36 perches from A.
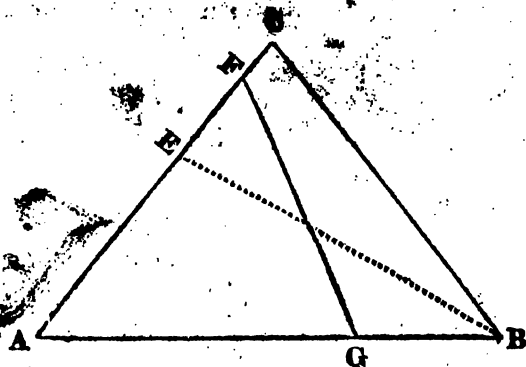
RULE.

By Problem 1, cut off 500 square perches, by a line from B to E.

$$\text{Thus: As } 800 \overset{AC}{\underset{}{..}} 40 : : 500 \overset{AE}{\underset{}{..}} 25.$$

Again. As 36 $\overset{AF}{..}$ 50 $\overset{AB}{::}$ 25 $\overset{AE}{..}$ 34.72 $\overset{AG}{}$ The answer.

PROBLEM IV.

To cut off, from a Square, or Oblong, any Part thereof.

Let ABCD be a square, each side whereof is 20 chains, and it be required to cut off, toward AB, 160 square chains, by a line parallel to AB.

Note. By Problem 4, page 105, lay off the proposed quantity, thus :

AB   AE or BF
20)160(8.0 Chains.
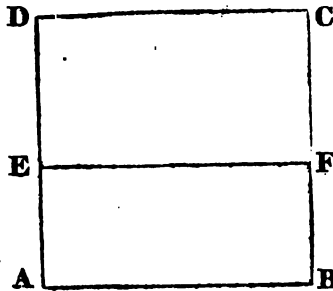
The method of dividing land, in other forms, will be shewn in examples as they occur.

EXAMPLE 1.

Taken in Perches.

A field, bounded as under specified, is to be divided into two equal parts, by a line parallel to AD or BC. Required the distance from AB that the division line EF must run.

Stations.	Bearings.	D. Pr.	N. L.	S. L.	E. D	W. D.
AB	South.	29.6		29.6		
BC	N. 80° W.	60.0	10.4			59.1
CD	N. 39 ½ W.	45.5	34.7			28.6
DA	S. 80 E.	89.4		15.5	87.7	
			45.1	45.1	87.7	87.7

Area of the Map ABCDA 2174.62 square perches.

- ½ to be taken off 1087.31 square perches.

Note. The learner is requested to work all the operations in full, in this and the following examples.
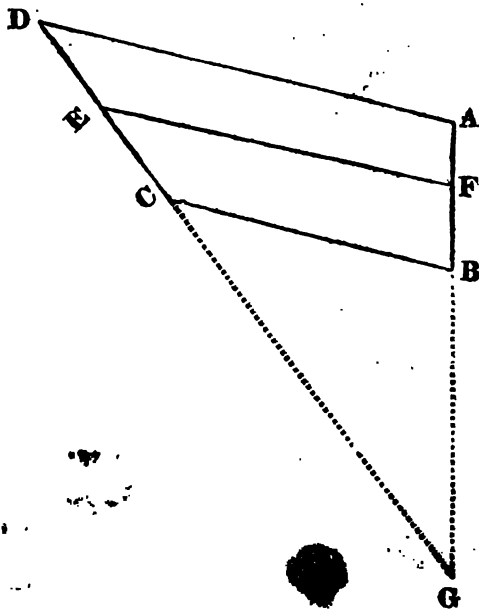
Continue AB and DC, until they intersect at G ; then in the triangle CBG, are given the side CB 60 perches, and by the bearings of the lines all the angles, viz. CBG 100°, CGB 39° 30′, GCB 40° 30′, to find the other requisites ; and by Case 1, Oblique Angled Trigonometry, page 81, the side BG is found to be 61.26 perches ; then by Problem 10, page 111, find the area of the triangle CBG.

As radius	90°		10.00000
Is to CB	60		1.77815
BG	61.26		1.78718
So is sine angle B	100°		9.99335
			13.55868
			10.00000
To the double area	$\frac{1}{2}$) 3619.8		3.55868

Area of CBG   1809.9 square perches.

Add   1087.31 = $\frac{1}{2}$ the area of the map

Area of EFG = 2897.21

Then to find GF, by Problem 2, page 173.

CGB   sqr. BG   EGF   sqr. of FG

As 1802.9 .. 3753 : : 2897.21 .. 6030.9662 $\sqrt{}$ 6030.9662

GF

= 77.65 perches, nearly,

Then $\left\{ \begin{array}{l} \text{GF} - \text{GB} = \text{BF} \\ 77.65 - 61.26 = 16.39 \text{ perches, the answer.} \end{array} \right.$

Draw FE parallel to BC, and it is done as required.

By the application of this method, a tract of land may be divided accurately, in any proportion, by a line run-

Z

ning in any assigned direction, where the triangle, formed
by continuing the lines, until they intersect (as the pre-
ceding) is not large; but in practical operations, it fre-
quently happens, that the logarithm of the double area,
is more than a number can be found for in the tables in
common use, without taking proportionals, which is trou-
blesome, and uncertain to be true; as is the case in the
present instance. Therefore, in order to give a clear
rule, invariably true in all cases, I bring forward the pre-
ceding triangle.

C
60 Per.
40.30
B
100°
I
39.30
G
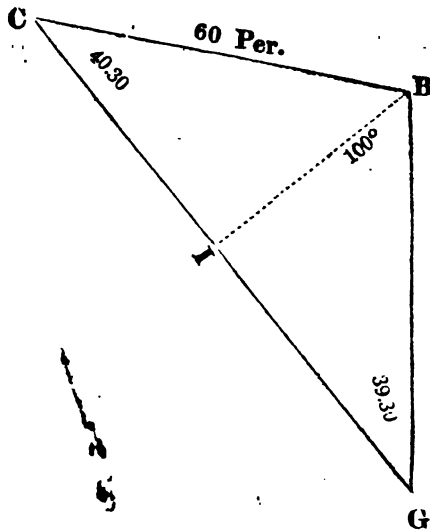
Always find the longest side of the triangle, for a base,
as by Case I, Oblique Angled Trigonometry, page 81,
CG is found to be 92.89 perches; then let fall a perpendi-
cular thereon from the oppo... angular point, as BI;

again, by Case 1, Right Angled Trigonometry, page 68, this perpendicular is found to be 38.97 perches, and being multiplied into the base, gives 3619.9 square perches, the double area of the triangle, the same as before nearly, and the small difference is owing to the logarithm being larger than a number could be found for in the table: this being done, proceed to find the place of the division line, as before taught. Or,

Note. When the three sides of an oblique angled triangle are given, to find the area, the bases made by the perpendicular, as above, may be found by the rule to Case 6, Oblique Angled Trigonometry, performing the operation either by the logarithms, or arithmetically; then find the perpendicular, by the Note to Problem 13, page 29; and thence, the area, more concise and true, than taught in Gibson's Surveying.

As $\begin{cases} \text{CG} & \text{Diff. of CB \& BG} & \text{CB \& BG} \\ 92.89 & .. \quad 1.26 \quad :: \quad 121.26 \quad .. \quad 1.64 \text{ Diff. of} \\ & \text{CI and IG.} \end{cases}$

Then from $\frac{1}{2}$ CG = 46.44, take $\frac{1}{2}$ the difference .82, leaves 45.62 CI.

Again, the square of CI is 2081.1844. The square of CB is 3600. Their difference is 1518.3156; the square root of which is 38.97 BI, the same as before.

I shall here give another method to make a Map from the Field Notes, which will be found very easy and convenient in many instances, although practised by none that I know of.

RULE.

Draw a meridian, and on it describe a circle with the chord of 60° in the compasses; then take in the compasses, from the same line of chords, the several bearings, and lay them on the circle from said meridian, the northerly from the top, and the southerly from the bottom, and number them 1, 2, 3, 4, &c. as in the annexed example; then from the centre (which will always be the place of beginning) through No. 1, draw a line, on which lay the first distance; then lay a parallel ruler on the centre, and No. 2, and open it to the second station, and there draw a line, and lay off the second distance, and so proceed with every number, remembering to draw the line northerly or southerly, as indicated by the bearing, and if the last three points be in a range, it denotes the work to be true.

		Ch.	
AB	S. 35° ¼ W.	5.60	
BC	N. 45 W.	12.18	
CD	N. 15 ½ E.	5.40	
DE	S. 77 E.	8.00	
EF	S. 87 ½ E.	10.75	Field Notes.
FG	S. 60 E.	7.40	
GH	South.	5.48	
HA	N. 85 W.	14.60	

(See the following Figure.)

N

D

E F

W

C G

8 E

A

B

S 7
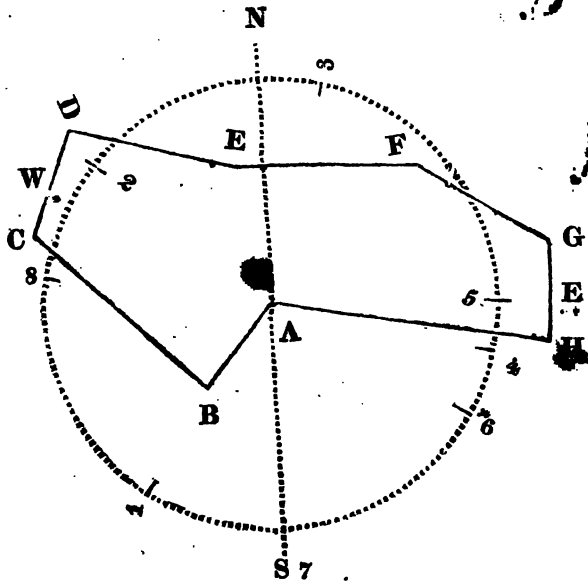
Example 2.

Required the area of the preceding Map, and to cut off 10A. 3R. 24P. to the westward, by a line issuing from the point A, and to find the bearing and distance of the division line.

Stations	Bearings.	D. Ch.	N. L.	S. L.	E. D.	W. D.
AB	S. 35¼ W	5.60		4.57		3.23
BC	N. 45 W	12.18	8.61			8.61
CD	N. 15½ E	5.40	5.20		1.44	
DE	S. 77 E.	8.00		1.80	7.80	
EF	N. 87½ E.	10.75	0.47		10.73	
FG	S. 60 E.	7.40		3.70	6.41	
GH	South.	5.48		5.48		
HA	N. 85 W	14.60	1.27			14.54
			15.55	15.55	26.38	26.38

Area 21A. 1R. 35P.
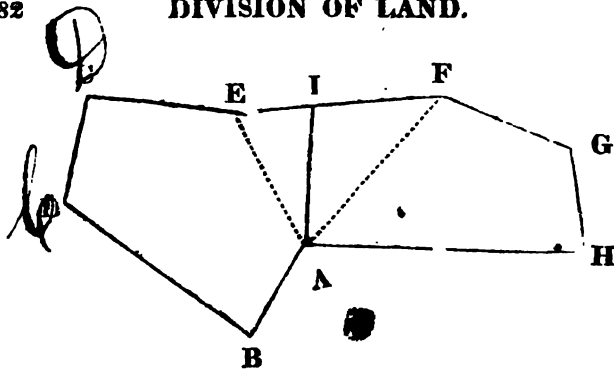
Find the area of ABCDEA, supposing that to be nearest the quantity proposed.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
AB	S. 35 ¼ W.	5.60		4.57		3.23
BC	N. 45 W.	12.18	8.61			8.61
CD	N. 15 ½ E.	5.40	5.20		1.44	
DE	S. 77 E.	8.00		1.80	7.80	
EA	S. E.			7.44	2.60	

Area 10A. 3R. 24P. — 9A. 1R. 23P. = 1A. 2R. 1P.
= 1.50625A. to be taken out of the triangle AEFA.

Find the area of AEFA.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
AE	N. W.		7.44			2.60
EF	N. 87 ½ E.	10.75	0.47		10.73	
FA	S. W.			7.91		8.13

Area 4.05 acres.

Then, by Problem 1, page 172.

$$\text{As}\left\{\begin{array}{llll}\text{AEFA} & \text{.. EF} & \text{:: AEIA} & \text{.. EI} \\ 4.05 & \text{.. } 10.75 & \text{:: } 1.50625 & \text{.. } 3.99\end{array}\right\}\text{Chains.}$$

To find the bearing and distance of the division line AI or IA.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
AE	as before.	7.44				2.60
EI	N. 87 ½ E.	3.99	0.17		3.99	
IA	S. W.			7.61		1.39

With the difference of latitude 7.61 chains south, and departure 1.39 chains west; the bearing and distance of the division line is found to be, viz.

$$\text{Answ.}\left\{\begin{array}{l}\text{IA S. } 10°\ 21'\ \text{W.} \\ \text{AI N. } 10°\ 21'\ \text{E.}\end{array}\right\}7.73\text{ chains.}$$

EXAMPLE 3.

Taken in Perches.

Let ABCDEFGHIA be a tract of land, to be divided into two equal parts, by a line from the point I. Required the bearing and distance of the division line.

Again; it is required to cut off 38 acres, 16 ½ perches to the south end of this tract, by a line running from E. due W. 40 perches, to a well. The bearing and distance of the division line from the well to the opposite boundary is required.

The field notes are as under.

Stations	Bearings.	D. Per.	N. L.	S. L.	E. D.	W. D.
AB	N. 19° E.	108.	102.1		35.2	
BC	S. 77 E.	91.		20.5	88.7	
CD	S. 27 E.	115.		102.5	52.2	
DE	S. 52 W.	58.		35.7		45.7
EF	S. 15 ½ E.	76.		73.2	20.3	
FG	West.	70.9				70.9
GH	N. 36 W.	47.	38.0			27.6
HI	North.	64.3	64.3			
IA	N. 62 ¼ W.	59.	27.5			52.2

Area 152A. 1R. 25.9P.

(See the following figure.)
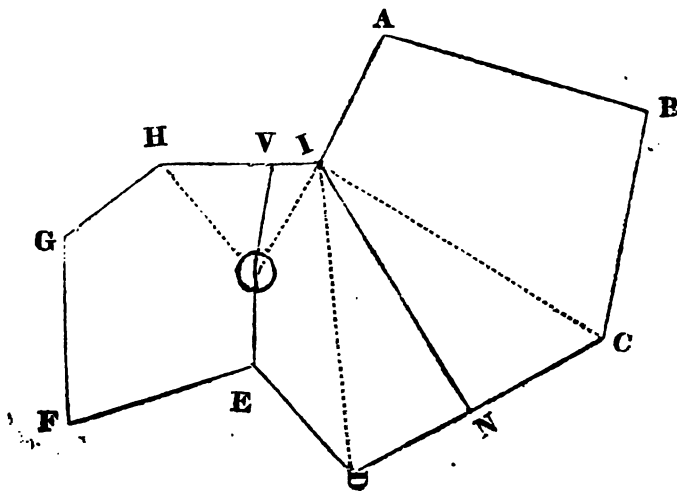
Find the area of IABCI.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D	W. D.
IA	N. 62° ¼ W.	59.	27.5			52.2
AB	N. 19 E.	108.	102.1		35.2	
BC	S. 77 E.	91.		20.5	88.7	
CI	S. W.			109.1		71.7

Area 8722.3 perches.

From half the area of the map, 12192.9 perches.
Take the above area,   8722.3 perches.

Leaves less than half   3470.6

Find the area of ICDI.

Stations.	Bearings	Dist.	N. L.	S. L.	E. D.	W. D.
IC	N. E.		109.1		71.7	
CD	S 27 E	115.		102.5	52.2	
DI	S. W.			6.6		123.9

Area 6522.1

As $\left\{ \begin{array}{l} \text{ICDI} \ .. \ \text{CD} \ :: \ \text{ICNI} \ .. \ \text{CN} \\ 6522.1 \ .. \ 115 \ :: \ 3470.6 \ .. \ 61.19 \end{array} \right\}$ Perches.

A a

To find the bearing and distance of the division line
NI or IN.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W.D.
IC	as before		109.4		71.7	
CN	S. 27° E.	61.2		54.5	27.8	
NI	S. W.			54.6		99.5

With the difference of latitude 54.6 south, and departure
99.5 perches west; the bearing and distance is found to
run, viz. .

Answer. $\begin{Bmatrix} \text{NI S. } 61\frac{1}{4} \text{ W.} \\ \text{IN N. } 61\frac{1}{4} \text{ E.} \end{Bmatrix}$ 113.5 Perches.

This completes the first division, as required.

For the southern division.

Find the area of ⊙EFGH⊙.

Stations	Bearings.	D. P.	N. L.	S. L.	E. D.	W.D.
⊙E	East.	40.			40.0	
EF	S. 15° ½ E.	76.		73.2	20.3	
FG	West.	70.9				70.9
GH	N. 36 W.	47.	38.0			27.6
H⊙	N. E.		35.2		38.2	

Area 5270.5 Perches.

From 38A. 0R. 16.5P. = 6096.5P.
Take the above area = 5270.5
                     ―――――――
Leaves   826. Perches.

Find the area of ⊙HI⊙.

Stations.	Bearings	Dist.	N. L.	S. L.	E. D.	W.D.
⊙H	S. W.			35.2		38.2
HI	North.	64.3	64.3			
I⊙	S. E.			29.1	38.2	

Area 1228.13 Perches.

HⓄIH .. HI :: HⓄVH .. HV
1228.13 .. 64.3 :: 826 .. 43.2½ Perches.

Find the bearing and distance from the Well to V.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W.D.
⊙H	as before			35.2		38.2
HV	North.	43.2	43.2			
V⊙	S. E.			8.0	38.2	

With the difference of latitude and departure of V⊙, the bearing and distance of the division line from the Well to the opposite boundary, is found to run, viz.

Answer.
$$\left\{ \begin{array}{l} \text{V⊙ S. 78° 10' E.} \\ \text{⊙V N. 78 10 W.} \end{array} \right\} \text{39.03 Perches}$$

Which completes the division as required.

EXAMPLE 4.

Admit a field bounded, as after specified, is to be divided into three equal parts, so that each may have the benefit of a well therein, and which bears from the place of beginning A, N. 60°, W. 14.35 chains, and is to be the first

division line. The quantity in each part, the bearing and distance of the other division lines are demanded.

Stations.	Bearings.	Dis.Ch.	N. L.	S. L.	E. D.	W. D.
AB	S. 80° W.	19.51		3.39		19.21
BC	N. 36 ¼ W.	16.61	13.39			9.82
CD	N. 70 E.	18.90	6.46		17.76	
DE	S. 63 ¼ E.	12.62		5.68	11.27	
EA	South.	10.78		10.78		

Area 38A. 3R. 17P. ÷ 3 = 12A. 3R. 32P.
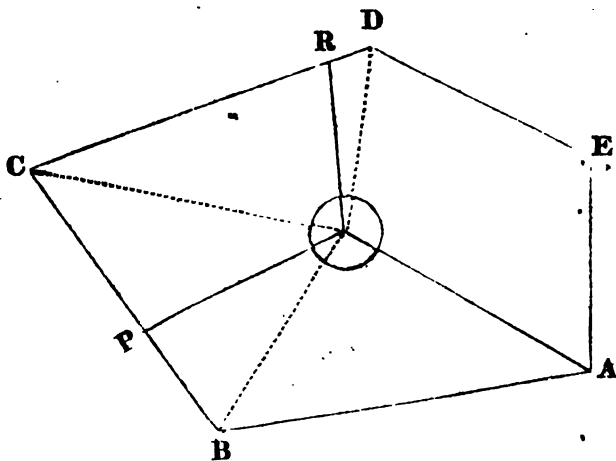
Find the area of ⊙AB⊙.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
⊙A	S. 60° E.	14.35		7.17	12.42	
AB	S. 80 W.	19.51		3.39		19.21
B⊙	N. E.		10.56		6.79	

Area 8.99 acres.

From one third of the map, viz. 12.95 acres.
Take ⊙AB⊙   8.99
                                           ⁄ ———
   Leaves BP⊙B   3.96
                                           ⁄ ———

Find the area of ⊙BC⊙.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
⊙B	S. W.			10.56		6.79
BC	N. 36¼ W.	16.61	13.39			9.82
C⊙	S. E.				2.83	16.61	

Area 9.73 acres.

⊙BC⊙ .. BC :: BP⊙B .. BP
9.73 .. 16.61 :: 3.96 .. 6.76

To find the bearing and distance of P⊙ or ⊙P.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
⊙B	as before.			10.56		6.79
BP	N. 36¼ W.	6.76	5.45			4.00
P⊙	N. E.		5.41		10.79	

With the difference of latitude and departure for P⊙ is found for the answer.

Answer. { P⊙ runs N. 64° 39' E. } 11.86 chains.
        { ⊙P runs S. 64 39 W. }

From ⊙BC⊙ = 9.73
Take BP⊙B = 3.96
             ———
Leaves P⊙CP = 5.77

From $\frac{1}{3}$ of the map = 12.95
Take P⊙CP   = 5.77

Leaves C⊙RC   = 7.18 acres.

Find the area of ⊙CD⊙.

Stations.	Bearings.	Dist.	N L.	S. L.	E. D.	W. D.
⊙C	N. W.		2.83			16.61
CD	N. 70 E.	18.90	6.46		17.76	
D⊙,	S. W.			9.29		1.15

Area 7.9 acres.

$$\text{As} \left\{ \begin{array}{l} ⊙CD⊙ .. \quad CD \ : : \ C⊙RC .. \quad CR \\ 7.9 \quad .. \ 18.9 \ : : \ 7.18 \quad .. \ 17.17 \end{array} \right.$$

To find the bearing and distance of R⊙ or ⊙R.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
⊙C	as before.		2.83			16.61
CR	N. 70 E.	17.17	5.87		16.13	
R⊙	S. W.			8.70	0.48	

As difference of latitude 8.70   93952
Is to radius 90°   10.00000
So is departure .48   9.68124

                                         9.68124
                                         0.93952

To tangent bearing 3° 9'.   8.74172

I have set down the above statement, as the departure is a negative number. See page 55.

The distance being found, as before, we have

Answer. $\left\{\begin{array}{l} \text{R}\odot \text{ runs S. } 3° \text{ } 9' \text{ W.} \\ \odot\text{R runs N. } 3 \text{ } 9 \text{ E.} \end{array}\right\}$ 8.71 chains.

EXAMPLE 5.

Admit a piece of land, bounded as after specified, is to be divided thus, viz. by a line GI parallel to AB, to issue from the point G, in the line BC 5.45 chains from the corner B, and on the line BG to lay off two acres in a parallellogram, and calculate the remainder cut-off by this division line GI.

Again; a division line to issue from the point E, to the opposite boundary BC, and to run parallel to AB, and another division line to issue from the point H, in the line CD 4.16 chains. from the corner C, and to run parallel to CB, until it intersects the former division line. Required the area of each piece separately.

The field notes.

			Ch.
AB	N.	63° W.	5.56
BC	N.	27 E.	18.56
CD	S.	27 E.	10.81
DE	S.	62½ W.	4.05
EF	S.	5¼ W.	5.00
FA		59° 18' W.	5.03

The Map being made, draw GI as proposed, and on BG lay off two acres, by the parallel line RS, which by Problem 4, page 105, will be found to be 3.67 chains nearly from the line BG; then,

AB — BR = AR

5.56 — 3.67 = 1.89 Chains.

Now, to find the distances SI and IF, find the bearing and distance of SF.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D	W.D.
FA	S. 59° 18′ W.	5.03		2.57	.	4.33
AR	N. 63° W.	1.89	0.85			1.68
RS	N. 27 E.	5.45	4.85		2.47	
SF	S. E.			3.13	3.54	

With the difference of latitude and departure, SF is found to bear S. 48° 31′, E. 4.72 chains; then in the triangle SFI, are given the angles by the bearing of the lines, viz. FSI 14° 29′, SFI 53° 46′, SIF 111° 45′, and the side SF 4.72 chains, to find the sides SI and IF; and by Case 1, Oblique Angled Trigonometry, they are found to be SI 4.10 chains, IF 1.27 chains; then to find the area of ARSIFA, are the following field notes.

$$SI + GS = GI$$
$$4.10 + 3.67 = 7.77 \text{ Chains.}$$

Ch.

AR	N. 63°	W.	1.89
RS	N. 27	E.	5.45
SI	S. 63	E.	4.10
IF	S. 5¼	W.	1.27
FA	S. 59.18	W.	5.03

Area 1A. 3R. 21.9 Perches.

Now IF — EF = EI
1.27 — 5.00 = 3.73 Chains.

B b

From the point E, let fall a perpendicular on the line GI; then in the right angled triangle VEI, are given the hypothenuse 3 chains, 73 links; and by the bearings of the lines, the angle VEI 21° 45′, VIE 68° 15′, to find the base VI, 1 chain, 38 links, and perpendicular VE, 3 chains 46 links = GO.

$$GI - VI = GV = OE$$
$$7.77 - 1.38 = 6.39 = 6.39 \text{ chains.}$$

To find the area of the Trapezoid IGOE.

$$\left\{ \begin{array}{l} IG + EO \times \text{by } \tfrac{1}{2} \, OG = \quad \text{Area.} \\ 7.77 + 6.39 \times \quad 1.73 = 2A. \ 1R. \ 32P. \end{array} \right.$$

$$BG + GO = BO$$
$$5.45 + 3.46 = 8.91 \text{ chains.}$$

And $BC - BO = OC$
$$18.56 - 8.91 = 9.65 \text{ chains.}$$

From the point H, let fall a perpendicular on the line OC; then in the right angled triangle HNC, are given the hypothenuse 4 chains, 16 links, and by the bearings of the lines, the angle NCH 54°, and NHC 36°, to find the base NC, 2 chains, 44 links, and perpendicular NH = LO, 3 chains, 37 links.

$$\text{Then } OC - NC = ON = HL$$
$$9.65 - 2.44 = 7.21 = 7.21 \text{ chains.}$$

To find the area of the Trapezoid OCHL.

$$\left\{ \begin{array}{l} OC + HL \times \text{by } \tfrac{1}{2} \, LO = \quad \text{Area.} \\ 9.65 + 7.21 \times \quad 1.685 = 2A. \ 3R. \ 14P. \end{array} \right.$$

EO — LO = EL.
6.39 —·3.37 = 3.02 chains.

CD — CH = HD.
10.81 — 4.16 = 6.65 chains.

To find the area of **ELHDE,** the following notes arise.

Ch.

EL N. 63° W. 3.02⎤
LH N. 27 E. 7.21⎟
HD S. 27 E. 6.65⎬ Area 2A. 1R. 29 Per. nearly.
DE S. 62 ½ W. 4.05⎦

EXAMPLE 6.

Suppose a survey to be made as follows, viz.
AB east 20. chains,
BC north 18. chains,
CD north 30° west, so far as will inclose 120½ acres,
the north boundary **DE,** to be due west 17. chains from
the north 30° west line. Required the distance on this
line; also the bearing and distance of the closing line **EA,**
to include 120½ acres.

Note. The propriety of this example being under the head of Division,
may, perhaps, be doubted by some; but the calculations are so nearly
allied thereto, that I thought it admissible.

From the point **C,** draw Cd due west 17 chains; then
by problem 9, page 110, the area of ABCdA, is found
to be 33.3 acres; continue AB, and from the point C, re-
verse CD, to meet AB in the point L; then in the right
angled triangle BCL, are given the perpendicular BC, 18
chains, and the angles, by Position 4, page 12, and Po-

sition 2, page 10, to find the base BL 10.39 chains, and
hypothenuse CL 20.79 chains; then by Position 6, page
13, the area of the triangle BCL, is found to be 9.35
acres.

$$ABCDEA \; - \; ABCdA \; = \; AdCDEA$$
$$120.5 \quad - \quad 33.3 \quad = \quad 87.2 \; Acres.$$

And $\begin{cases} ABCdA + BCLB = ALCdA \\ 33.3 \; + \; 9.35 \; = \; 42.65 \; Acres. \end{cases}$

Then say,

As $\begin{cases} ALCdA \; .. \; LC \; :: \; AdCDEA \; .. \; CD \\ 42.65 \; .. \; 20.79 \; :: \; 87.2 \; .. \; 42.50 \; chains. \end{cases}$
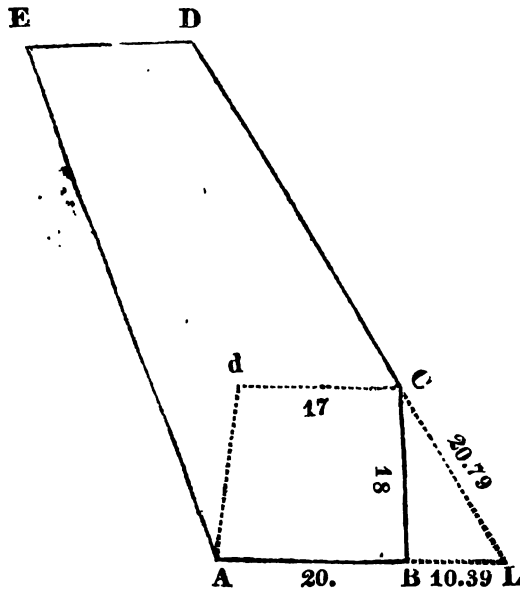
From thence the following notes, to prove the work, by calculating the quantity of land thereby inclosed, and to find the bearing and distance of the closing line EA.

Stations	Bearings.	D. C.	N. L.	S. L.	E. D.	W. D.
AB	East.	20.00			20.00	
BC	North.	18.00	18.00			
CD	N. 30 W.	42.50	36.80			21.25
DE	West.	17.00				17.00
EA	S. E.			54.80	18.25	

With the difference of latitude and departure of the closing line EA, it is found to run S. 18° 25', E. 57 chains, 76 links.

OF

INTERSECTIONS.

INTERSECTION is the bearings of an object from two stations; the bearing and distance of the stations being known, the distance to the object may be found: thence the plan of a field may be taken by intersections, when all the corners thereof can be seen from two stations, and the area of the field determined by calculations: an example of which follows; the bearing and distance between the two stations, and the bearings from them to the several corners of the field, being as in the following table.

The stations H and I, North and South 28 chains.

No.	Bearings.	No.	Bearings.
HA	S. 81° $\frac{1}{2}$ E.	IA	N. 28° $\frac{1}{2}$ E.
HB	S. 85 $\frac{3}{4}$ E.	IB	N. 42 $\frac{1}{4}$ E.
HC	S. 68 E.	IC	N. 51 $\frac{1}{2}$ E.
HD	S. 58 $\frac{1}{4}$ E.	ID	N. 74 E.
HE	S. 35 $\frac{1}{2}$ E.	IE.	N. 82 $\frac{1}{2}$ E.
HF	S. 28 $\frac{1}{2}$ E.	IF	N. 73 $\frac{1}{2}$ E.
HG	S. 40 E.	IG	N. 60 E.

By Case 1, Oblique Angled Trigonometry, find the distance from either station, as from I, to the several corners of the field, thus:

To find IA.

As sine [A	70°	9.97299
Is to IH	28 ch.	1.44716
So is sine [H.	81° 30′	9.99520
		11.44236
		9.97299
To IA.	29.47	1.46937

To find IB.

As sine [B	52	9.89653
Is to IH	28	1.44716
So is sine [H.	85.45	9.99880
		11.44596
		9.89653
To IB	35.48	1.54943

(See the following Map.)

THE MAP.
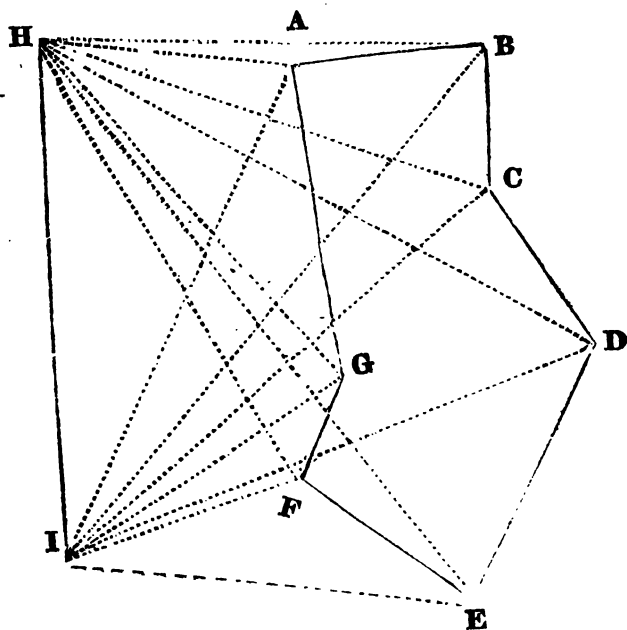
To find IC.

As sine [C	60.30		9.93970
Is to IH	28		1.44716
So is sine [H	68		9.96717
			11.41433
			9.93970
To IC	29.83		1.47463

To find ID.

As sine [D   50.45   9.88896
Is to IH   28   1.44716
So is sine [H 58.45   9.92960

                           ───────
                           11.37676
                           9.88896

      To ID   30.75   1.48780
                           ───────

To find IE.

As sine [E   47.   9.86413
Is to IH   28   1.44716
So is sine [H 35.30   9.76395

                           ───────
                           11.21111
                           9.86413

      To IE   22.23   1.34698
                           ───────

To find IF.

As sine [F   78.   9.99040
Is to IH   28   1.44716
So is sine [H 28.30   9.67866

                           ───────
                           11.12582
                           9.99040

      To IF   13.66   1.13542
                           ───────

C c

To find IG.

As sine [G 80.	9.99335
Is to IH 28	1.44716
So is sine [H 40.	9.80807
	11.25523
	9.99335
To IG 18.27	1.26188

The bearing and distance from the station I, to each
corner of the field, being ascertained, find the difference of
latitude and departure of each line inclosing the field; and
A being the corner of the survey to begin with. Reverse
the line from the next succeeding corner to the point I, &c.
as follows.

To find the difference of latitude and departure of AB.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
BI	S. 42° ¼ W.	35.43		26.23		23.82
IA	N. 28 ½ E.	29.47	25.90		14.06	
AB	N. E.		0.33		9.76	

To find the difference of latitude and departure of BC.

Stations	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
CI	S. 51 ½ W.	29.83		18.57		23.35
IB	N. 42 ¼ E.	35.43	26.23		23.82	
BC	S. W.			7.66		0.47

To find the difference of latitude and departure of CD.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
DI	S. 71 W.	30.75		10.01		29.08
IC	N. 51 ½E.	29.83	18.57		23.35	
CD	S. E.			8.56	5.73	

To find the difference of latitude and departure of DE.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
EI	N. 82½W.	22.23	2.90			22.04
ID	N. 71 E.	30.75	10.01		29.08	
DE	S. W.			12.91		7.04

To find the difference of latitude and departure of EF.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W.D.
FI	S. 73 ½W.	13.66		8.88		13.09
IE	S. 82 ½ E.	22.23		2.90	22.04	
EF	N. W.		5.78			8.95

To find the difference of latitude and departure of FG.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
GI	S. 60 W.	18.27		9.13		15.82
IF	N. 73 ½E.	13.66	3.88		13.09	
FG	N. W.		5.25		2.73	

To find the difference of latitude and departure of GA.

Stations.	Bearings.	Dist.	N. L.	S. L.	E. D.	W. D.
AI	S. 28½ W.	29.47		25.90		14.06
IG	N. 60 E.	18.27	9.13		15.82	
GA	N. W.		16.77			1.76

This being done, proceed to bring into a traverse table, the difference of latitude and departure of the several boundary lines, viz. AB, BC, &c. In the column for bearings, put the letters to denote the bearing of each line, and leave a blank for the degrees; also the distance column leave blank.

THE TRAVERSE TABLE.

Stations	Bearings.	D. C.	N. L.	S. L.	E. D.	W. D.
AB	N. 88° 4′ E.	9.77	0.33		9.76	
BC	S. 3.31 W.	7.66		7.66		0.47
CD	S. 33 48 E.	10.30		8.56	5.73	
DE	S. 28.36 W.	14.71		12.91		7.04
EF	N. 52.51 W.	11.22	6.78			8.95
FG	N. 27.28 E.	5.92	5.25		2.73	
GA	N. 5.59 W.	16.86	16.77			1.76
			29.13	29.13	18.22	18.22

Area 28A. 1R. 16P. *Nearly*

With the difference of latitude and departure of AB, find the bearing and distance, thus:

To find the bearing.

As the diff. of latitude	.33 —	1.51851
Is to the dep.	9.76	0.98945
So is radius	90°	10.00000

| | | 10.98945 |
| | | — 1.51851 |

| To the tangent of the course | 88.4 | 11.47094 |

To find the distance.

As the sine of course	88.4	9.99975
Is to radius	90°	10.00000
So is the dep.	9.76	0.98945

| | | 10.98945 |
| | | 9.99975 |

| To the distance | 9.77 | .98970 |

To find the bearing of BC.

As the diff. lat.	7.66	0.88423
Is to the dep.	.47 —	1.67210
So is radius	90	10.00000

| | | 9.67210 |
| | | 0.88423 |

| To the tangent of bearing | 3° 31' | 8.78787 |

To find the-distance.

As the sine of course 3.31		8.78770
Is to radius 90°		10.00000
So is the departure .47 —		1.67210
		9.67210
		8.78774
To the distance 7.66		.88436

I have set down the operations in full, for finding the
bearings and distances of the two first lines, as the differ-
ence of latitude of one, and the departure of the other,
is less than unity, (see page 55) and made that side of the
supposed triangle radius, which is more than unity; pro-
ceed with the difference of latitude and departure of the
other lines, as before directed, and the several bearings
and distances will be found, as in the preceding traverse
table.   These operations will be profitable for the learner
to work in full.

The foregoing is the best method of finding the area of
a piece of land taken by intersections; but for the sake of
some variety, enlarging the ideas, and ripening the judg-
ment of the learner, I shall find the area of the preceding
by Problem 10, page 141, and first find the area of the
triangles formed from the point I, to these corners of the
field which include no part of the Map; and then to those
including the Map, and the sum of the outward triangles
taken from that of the inward, will leave the double area
of the Map.

To find the area of IAGI.

As radius	90°	10.00000
Is to IA ⎱	29.47	1.46938
IG ⎰	18.27	1.26174
So is sine [I.	31.30	9.71809

		12.44921
		10.00000

To double area	281.33	2.44921

To find the area of IGFI.

As radius	90	10.00000
Is to IG ⎱	18.27	1.26174
IF ⎰	13.66	1.13545
So is sine [I 13.30		9.36818

		11.76537
		10.00000

To double area	58.26	1.76537

To find the area of IFEI.

As radius	90	10.00000
Is to IF ⎱	13.66	1.13545
IE ⎰	22.23	1.34694
So is sine [I 24.		9.60931

		12.09170
		10.00000

To double area	123.51	2.09170

OF INTERSECTIONS.

To find the area of IABI.

As radius	90		10.00000
Is to IA ⎱	29.47		1.46938
IB ⎰	35.43		1.54937
So is sine [I 18.45			9.37600
			12.39475
			10.00000
To double area	246.17		2.39475

To find the area of IBCI.

As radius	90		10.00000
Is to IB ⎱	35.43		1.54937
IC ⎰	29.83		1.47465
So is sine [I	9.15		9.20618
			12.23015
			10.00000
To double area	169.9		2.23015

To find the area of ICDI.

As radius	90		10.00000
Is to IC ⎱	29.83		1.47465
ID ⎰	30.75		1.48784
So is sine [I 19.30			9.52350
			12.48599
			10.00000
To double area	306.2		2.48599

To find the area of IDEI.

As radius	90		10.00000
Is to ID	30.75		1.48784
IE	22.23		1.34694
So is sine [I 26.30			9.64953

12.48431
10.00000

To double area   805   2.48431

Double area.
IAGI	281.33	
IGFI	58.26	Add
IFEI	123.51	

IAGFEI   463.10

Double Area.
IABI	248.17	
IBCI	169.90	
ICDI	306.20	Add
IDEI	305.00	

1029.27

D d

		Double Area.
From	IABCDEI	1029.27
Take	IAGFEI	463.10
Leaves	ABCDEFGA	½)566.17
		A. 28,3085
		4
		R. 1,2340
		40
Area 28A. 1R. 9.36P.		P. 9,3600

The small difference between this method, and the former, is owing to some losses sustained in not finding the exact number answering to a logarithm, and to the advantage of two decimal figures in the difference of latitude and departure, in working the traverse table; therefore the first method is preferable.

OF

ATTRACTION.

IT sometimes happens, that the needle is attracted out of its customary position, by an unknown cause; but most probably owing to some matter near the surface of the earth: as it is frequently observable where there is the appearance of iron-stone; and this attraction will frequently vary in quantity, and in denomination, at every station. Therefore, to take the bearings truly, where the needle is attracted, observe the following directions; as for example.

Suppose a field, bounded as by the Map in the following page, to be so situated; a true survey of which is required.

Note. Particular care must be taken to count the degrees at every station from the same end of the needle; as in this example, I count from the north end.

Seek a place where two stations can be taken, without attraction; this may be tried and proved by back-sights, and the nearer to one corner of the field the better, whether within or without the inclosure, as for instance; suppose I set my instrument at G, and take the bearing to H, and then by a back-sight from H to G, the bearing is the same; therefore no attraction at either of these stations. Then from H, I take the bearing to A, one corner of the field, and it is N. 25° W. then by a back-sight H bears
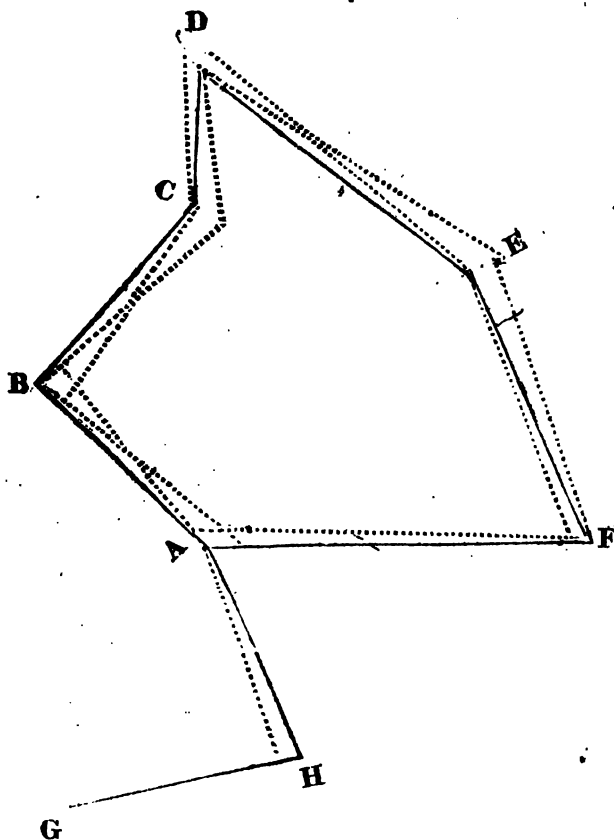
Note. The dotted lines represent the Magnetic points.

from A, S 22° ½ E. therefore at A, the north point of
the needle is attracted 2½ degrees westerly; then turning
the sights to B, it bears N. 40° ½ W. to this, add the
attraction 2½ degrees, and it gives the true bearing N. 43°
W. distance measured is 7 chains, 20 links. Then, by a
back-sight, A bears from B, S. 46° E. therefore the north
point is attracted 3 degrees easterly at this place; then,

turning the sights to C, and it bears N. 45° $\frac{1}{2}$ E. and abating three degrees, the attraction, it leaves the true bearing N. 42° $\frac{1}{2}$ E. 7 chains, 28 links; then, by a back-sight, B bears from C, S. 40° W. hence at this station, the north point is attracted 2$\frac{1}{2}$ degrees westerly; then turning the sights to D, it bears N. 2$\frac{1}{2}$ E. and the attraction being abated, makes it a due north course, 4 chains, 10 links; then, by a back-sight, C bears from D, S. 4° W. Hence the north point here is attracted 4 degrees westerly; then turning the sights to E, it bears S. 57° $\frac{1}{2}$ E. from which take the attraction, and it leaves the true bearing. S. 53° $\frac{1}{2}$, E. 10 chains, 75 links; then, by a back-sight. D bears from E, N. 50 W. therefore, here the north point is attracted 3$\frac{1}{2}$ degrees easterly; then, turning the sights to F, it bears S. 18 E. to this add the attraction 3$\frac{1}{2}$ degrees, and it gives the true bearing, S. 21°$\frac{1}{2}$, E. 8 chains, 97 links; then, by a back-sight. E bears from F, N. 19°, $\frac{1}{2}$ W. hence the north point here is attracted two degrees westerly; then, turning the sights to A, the place of beginning, it bears, N. 89 W. From this, take the attraction, and it leaves the course to be due west. 11 chains, 93 links.

Hence, the true field notes are.

		Ch.
		Ch.
AB	N. 43° W.	7.20
BC	N. 42$\frac{1}{2}$ E.	7.28
CD	North.	4.10
DE	S. 53$\frac{1}{2}$ E.	10.75
EF	S. 21$\frac{1}{2}$ E.	8.97
FA	West.	11.93

Area 13A. 3R. 34P. +

Care must be taken to have things in good order; the needle must traverse well, the instrument set level, a small straight rod to take the sights to, and that set perpendicular, otherwise inaccuracies will arise.

The attraction, when westerly, and the next station is to the westward of the meridian, then the attraction must be added to the bearing given by the needle, for the true bearing; but if the next station be eastward of the meridian, then the attraction must be taken from the bearing given by the needle for the true bearing: so, when the attraction is easterly, and the succeeding station eastward of the meridian, then the attraction must be added to the bearing given by the needle for the true bearing; but if the next station be west of the meridian, then the attraction must be taken from the bearing given by the needle for the true bearing between the present and next stations.

These observations being strictly attended to, the bearings of a field may be truly taken, where the needle is attracted; although the station, as at H, be so remote from the land to be surveyed, as to require several stations and courses to arrive at one corner of the field.

VARIATION.

IT is well known, that there is a Variation in the needle, from pointing due North and South; and this variation is continually progressive. Hence it is, that the bearings of lines, taken some years ago, and the present time, do not agree; therefore, to find the difference between them, and the true bearing, at the present time.

Run the line according to the given bearing, and observe the nearest distance between the line so run, and the corner. Then——

As the length of the whole line,
Is to 57.3 degrees;
So is the said distance,
To the difference of variation required.

EXAMPLE.

Suppose a line, some years ago, bore N. 45° E. distance 20 chains; and in running this line, by the given bearing, the corner is found 20 links to the left hand.

Required the bearing at the present time.

As $\left\{\begin{array}{l}\text{Ch.} \quad \text{Deg. Links.} \\ \text{20 .. 57.3 : : 20 .. } 0°\ 34' \text{ to be abated.}\end{array}\right.$

Hence the bearing is N. 44° 26′ E.

This rule is sufficiently exact in common practice, where the bearing and measure were both true; but in some old surveys, there are great inaccuracies : Therefore, the best way is, after running on the given bearings a convenient distance, to take the bearing and distance to the succeeding corner. Then find the bearing and distance between the corners, as taught in Division of Land, and in Intersections.

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TO FIND THE VARIATION OF THE COMPASS

BY AN

AMPLITUDE.

RULE 1. To the log. Secant of the latitude, rejecting the index, add the log. sine of the sun's declination, corrected for the time and place of observation; their sum will be the log. sine of the true amplitude, to be reckoned from the east in the morning, or west in the afternoon, towards the north or south according to the declination.

2. Then if the true and magnetic amplitudes, be both north, or both south, their difference is the variation; but if one be north and the other south, their sum is the variation; and to know whether it be easterly or westerly, suppose the observer looking towards that point of the compass representing the magnetic amplitude. Then if the true amplitude be to the right hand of the magnetic amplitude, the variation is east; but if to the left hand, it is west.

E e

EXAMPLE 1.

July 3, 1812, in latitude 9° 36′ S. the sun was observ-
ed to rise E. 22° 42′ N. required the variation of the
compass.

Latitude	9° 36′ S.		Secant	0.00618
Declination	22 59 N.		Sine	9.59158
True Amplitude	23° 20′ N.		Sine	9.59771
Mag. Amplitude	12 42 N.			

Variation   10° 38′ West, because the true Am-
plitude is to the left of the magnetic.

EXAMPLE 2.

September 24, 1812, in latitude 26° 32′ N. and longi-
tude 78° W. by the sun's centre, was observed to set W.
6° 15′ S. about 6 h. P. M. required the variation of the
compass.

Sun's Declination	0	30′ S.		
Corr. for long. 78° W.	+	5		
Corr. for time 6 h. P. M.	+	6		
Reduced Declination	0	41′	Sine	8.07650
Latitude	26	32	Secant	0.04834
True Amplitude W.	0	46′ S.	Sine	81.2484
Mag. Amplitude W.	6°	15′ S.		

Variation   5° 29′ East, because the
true amplitude is to the right hand of the magnetic.

TO FIND THE VARIATION OF THE COMPASS

BY AN

AZIMUTH.

RULE 1. Reduce the sun's declination to the time and place of observation, and compute the true altitude of the sun's centre.

2. Subtract the sun's declination from 90°, when the latitude and declination are of the same name, or add it to 90°, when they are of contrary names; and the sum of the remainder, will be the sun's polar distance.

3. Add together the sun's polar distance, the latitude of the place and the altitude of the sun; take the difference between half their sum and the polar distance, and note the remainder.

4. Then add together
The log. secant of the altitude,⎫
The log. secant of the latitude,⎬ rejecting their indices.
The log. co-sine of the half sum,⎭
And the log. co-sine of the remainder.

5. Half the sum of these four logarithms will be the sine of an arch, which doubled, will be the sun's true azimuth; to be reckoned from the north in south latitude, towards the west in the afternoon.

6. Then, if the true and observed azimuths be both on the east and on the west side of the meridian, their

difference is the variation: but if one be on the east and
the west side of the meridian, their sum is the variation;
and to know if it be east or west, suppose the observer
looking towards that point of the compass representing
the magnetic azimuth; then, if the true azimuth be to
the right of the magnetic, the variation is east, but if.
the true be to the left of the magnetic, the variation is
west.

EXAMPLE.

November 2, 1812, in latitude 25° 32' N. and longi-
tude 75° W. the altitude of the sun's lower limb was ob-
served to be 15° 56' about 4 h. 10 m. P. M. his magnetic
azimuth being S. 58° 32' W. and the height of the eye
18 feet, required the variation of the compass.

Sun's de. Nov. 2 at n.	14°	48'	S. Obs. alt. Sun's		
Corr. for long. 75° W.	+	4	lower limb	15	56
Co. for ti. 4h. 10m. af'n.	+	3	Semidiam. 16 }	+	12
			Dip. 4 }		
Reduced declination.	14	55		15	48
	90	00	Refraction		3
Polar distance	104°	55'	True Altitude	15	45
Altitude	15	45			
Latitude	25	32	Secant	0.01662	
			Secant	0.04463	
Sum	146°	12'			
Half	73	6			
Remainder	31°	49'	Co-sine	9.46345	
			Co-sine	9.92929	
	32	14			
		2		19.45399	
			Sine	9,72699	
True azimuth	S. 64	28 W.			
Magnetic Azimuth	S. 58	32 W.			

Variation   5 56 East, because the true
azimuth is to the right of the magnetic.

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TO ENLARGE OR DIMINISH

M A P S.

To enlarge a Map to Two, Three, or four times the Size.

LET the dotted lines *a, b, c,* &c. represent a Map, or Survey, laid down by a scale of 40 perches to an inch, and it be required to enlarge it to one laid down by a scale of 20 perches to an inch.

Pitch upon any convenient place, within the Map, for a centre, as ⊙; then lay a straight edged ruler on the centre, and point *a*; take in the compasses, the distance from this centre to *a*, and set it from *a* to A; then lay the ruler on the centre and *b*, and the distance from the centre to *b*, lay from *b* to B; join AB. Thus proceed with every station, and the Map ABCDEFGHIKL, will be double the size of the other.

If it were required to enlarge the Map three or four times the size, then the distances from the centre to each station, must be laid over as many times, &c.

If it be required to reduce a Map from 20 to 40 perches to an inch, then half the distance from the centre to each

station, must be laid inside the Map; and so of any other proportion.
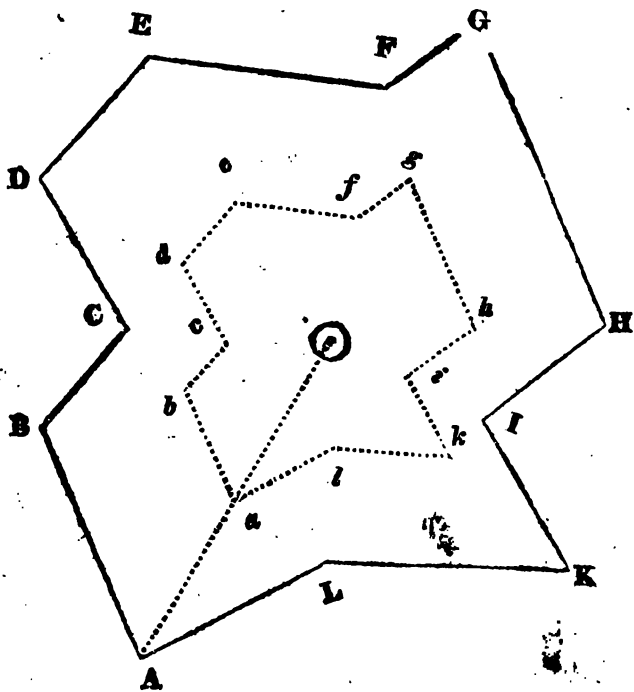
TO SURVEY

WITH THE CHAIN ONLY.

A Field so situated, that all the angles can be seen at one view, may be accurately measured by the Chain only. As for instance, suppose a field, or piece of land, bounded as in the following figure.——Then,

Measure from B to G, 6 chains, and perpendicular thereto measure aA 2 chains, 20 links, and perpendicular to BG, measure cC 2 chains, 27 links, and Bc 1 chain, 14 links; then CE 4 chains, 21 links, and perpendicular thereto dD, 3 chains, 19 links. Again; perpendicular to BG, measure hE 4 chains, 90 links, and perpendicular thereto gF, 89 links, and hG 1 chain, 53 links; then, consequently, hc will be 3 chains, 33 links; hg being measured, will be 3 chains, 20 links, leaving gF 1 chain, 70 links. And as each line is measured, draw it on paper with a pencil, and the several angles by the eye, marking each line with its own distance. This rough draught will greatly assist the memory in calculating.

By the preceding Problems, the area of the several triangles, &c. will be found to be ——

	Sqr. Ch.	
ABGA	6.6000	⎫
BCcB	1.2939	⎪ By Problem 6, page 107.
CDEC	6.71495	⎬
EFgE	0.7565	⎭
FGhgF	3.8720	⎫ By Problem 9, page 110.
CEhcC	11.93805	⎭

3.117540 = 3A. 0R. 18.8P. +
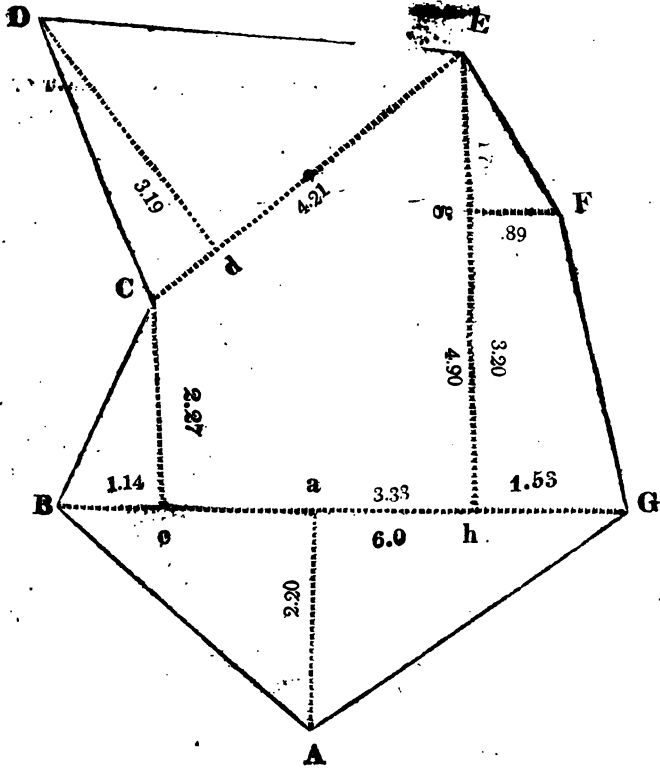
By measuring Ba, and Cd, with those already made, a true Map of the field may be constructed. For BG, being laid down from a scale of equal parts, and aA, from the same scale, it's proper distance from B, will determine the point A, and the perpendicular cC, will fix the point C; then with cE in the compasses, and one foot in C, describe an arch, as at E; and with hE in the compasses, and one foot in h, intersect the arch at E, which fixes the point E, and the perpendicular dD, it's proper distance from C, determines the point D; then from g lay off the perpendicular gF, and draw the lines AB, BC, CD, &c. and a Map of the Field is completed.

Admit a field bounded as in the following figure; the dimensions of which are, AB 27 chains, 35 links; BC 22 chains, 20 links; CD 29 chains, 25 links; DE 23 chains, 70 links; and EA 31 chains, 15 links: The diagonal BE 38 chains, and EC 40 chains, 10 links; and from this measure it is required to make the Map, and find the area thereof.

TO MAKE THE MAP.

Draw AB it's proper length; then, with the diagonal BE in the compasses, and one foot in the point B, describe an arch at E; then take AE in the compasses, and with one foot in A, cross the former arch, and the place of intersection fixes the point E. Again; take EC, and with one foot in E, make an arch at C; then, with BC, and one foot in B, intersect the arch at C, which fixes that point. Again; with CD in the compasses, and one foot in C, make an arch at D; then, with DE, and one foot

F f

in E, intersect the arch at D, for the point D.   Lastly;
draw lines from point to point, and the Map is made.
Draw the diagonals, and the Map is divided into three
oblique angled triangles. Then divide each of these into
two right angled triangles, by Case 6, Oblique Angled
Trigonometry, thus—

As the sum of Ba, and aE   3 8   1.57978
Is to the diff. AB and AE   3.8   0.57978
So is their sum   58.5   1.76716

2.34694
1.57978

$\frac{1}{2}$)

To the diff. of Ba, and aE   5.85   0.76716

2.92

From half the sum of Ba, and aE   19
Take half their diff.   2.92

Remains the least base Ba   16.08

(See the following Map.)
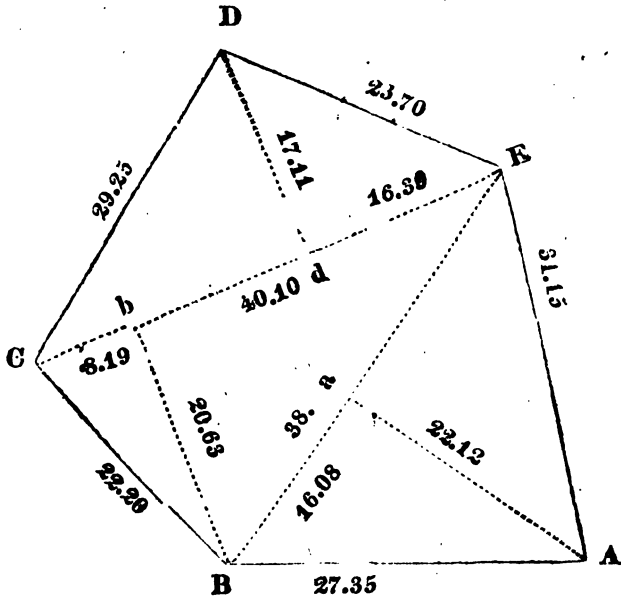
Then AB 27.35 × 27.35 = 748.0225, and Ba 16.08 × 16.08 = 258.5664.

From the square of AB, take the square of Ba, leaves 489.4561, the square of Aa: the square root of which, is 22 chains, 12 links = Aa. Thus proceed with the others, and they will be found as in the figure.

Sqr. Ch.

Area of ABEA, is 420.28 by Problem 6, page 107.
BCDEB, is 756.687 by Problem 8, page 109.
_____
117.6967 = 117A. 2R. 31.472P.
_____

FINIS.
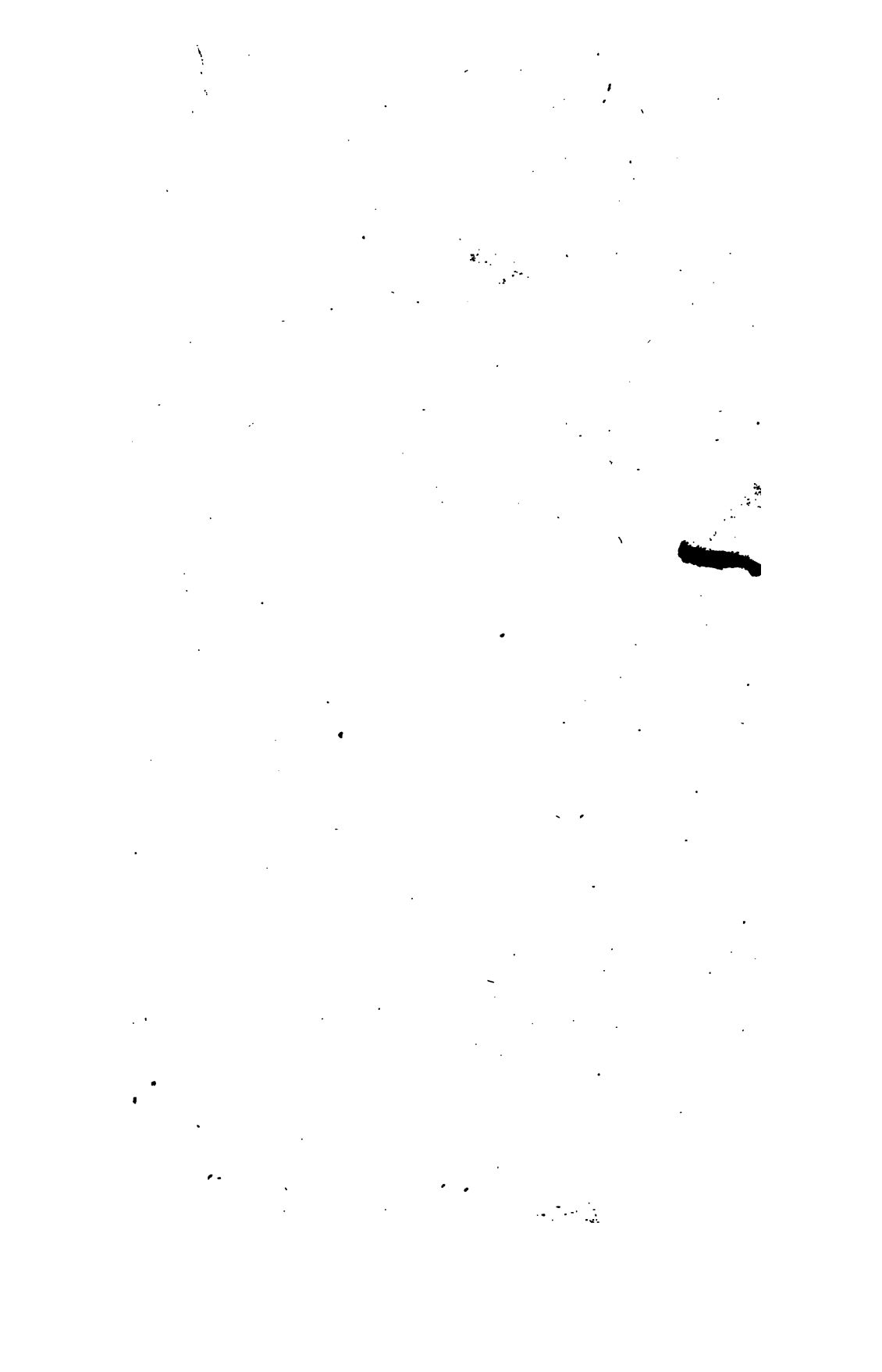
TABLES

OF

DIFFERENCE

OF

LATITUDE AND DEPARTURE:

CONSTRUCTED

EVERY QUARTER OF A DEGREE OF THE QUADRANT,

AND CONTINUED

FROM ONE TO THE DISTANCE

OF

ONE HUNDRED MILES OR CHAINS.

I, Travers Ya??

S.TD

Dist	1 Deg.		1¼ Deg.		1½ Deg.		1¾ Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	1.00	0.02	1.00	0.02	1.00	0.03	1.00	0.03	1
2	2.00	0.03	2.00	0.04	2.00	0.05	2.00	0.06	2
3	3.00	0.05	3.00	0.07	3.00	0.08	3.00	0.09	3
4	4.00	0.07	4.00	0.09	4.00	0.10	4.00	0.12	4
5	5.00	0.09	5.00	0.11	5.00	0.13	5.00	0.15	5
6	6.00	0.10	6.00	0.13	6.00	0.16	6.00	0.18	6
7	7.00	0.12	7.00	0.15	7.00	0.18	7.00	0.21	7
8	8.00	0.14	8.00	0.17	8.00	0.21	8.00	0.25	8
9	9.00	0.16	9.00	0.20	9.00	0.24	9.00	0.28	9
10	10.00	0.17	10.00	0.22	10.00	0.26	10.00	0.31	10
11	11.00	0.19	11.00	0.24	11.00	0.28	10.99	0.34	11
12	12.00	0.21	12.00	0.26	12.00	0.31	11.99	0.37	12
13	13.00	0.23	13.00	0.28	13.00	0.34	12.99	0.40	13
14	14.00	0.24	14.00	0.31	14.00	0.37	13.99	0.43	14
15	15.00	0.26	15.00	0.33	14.99	0.39	14.99	0.46	15
16	16.00	0.28	16.00	0.35	15.99	0.42	15.99	0.49	16
17	17.00	0.30	17.00	0.37	16.99	0.45	16.99	0.52	17
18	18.00	0.31	18.00	0.39	17.99	0.47	17.99	0.55	18
19	19.00	0.33	19.00	0.41	18.99	0.50	18.99	0.58	19
20	20.00	0.35	20.00	0.44	19.99	0.52	19.99	0.61	20
21	21.00	0.37	21.00	0.46	20.99	0.55	20.99	0.64	21
22	22.00	0.38	21.99	0.48	21.99	0.58	21.99	0.67	22
23	23.00	0.40	22.99	0.50	22.99	0.60	22.99	0.70	23
24	24.00	0.42	23.99	0.52	23.99	0.63	23.99	0.73	24
25	25.00	0.44	24.99	0.55	24.99	0.65	24.99	0.76	25
26	26.00	0.45	25.99	0.57	25.99	0.68	25.99	0.79	26
27	27.00	0.47	26.99	0.59	26.99	0.71	26.99	0.83	27
28	28.00	0.49	27.99	0.61	27.99	0.73	27.99	0.86	28
29	29.00	0.51	28.99	0.63	28.99	0.76	28.99	0.89	29
30	30.00	0.52	29.99	0.65	29.99	0.79	29.99	0.92	30
31	31.00	0.54	30.99	0.68	30.99	0.81	30.99	0.95	31
32	32.00	0.56	31.99	0.70	31.99	0.84	31.99	0.98	32
33	32.99	0.58	32.99	0.72	32.99	0.86	32.98	1.01	33
34	33.99	0.59	33.99	0.74	33.99	0.89	33.98	1.04	34
35	34.99	0.61	34.99	0.76	34.99	0.92	34.98	1.07	35
36	35.99	0.63	35.99	0.79	35.99	0.94	35.98	1.10	36
37	36.99	0.65	36.99	0.81	36.99	0.97	36.98	1.13	37
38	37.99	0.66	37.99	0.83	37.99	0.99	37.98	1.16	38
39	38.99	0.68	38.99	0.85	38.99	1.02	38.98	1.19	39
40	39.99	0.70	39.99	0.87	39.99	1.05	39.98	1.22	40
41	40.99	0.72	40.99	0.89	40.99	1.07	40.98	1.25	41
42	41.99	0.73	41.99	0.92	41.99	1.10	41.98	1.28	42
43	42.99	0.75	42.99	0.94	42.99	1.13	42.98	1.31	43
44	43.99	0.77	43.99	0.96	43.99	1.15	43.98	1.34	44
45	44.99	0.79	44.99	0.98	44.99	1.18	44.98	1.37	45
46	45.99	0.80	45.99	1.00	45.99	1.20	45.98	1.40	46
47	46.99	0.82	46.99	1.03	46.99	1.23	46.98	1.44	47
48	47.99	0.84	47.99	1.05	47.99	1.26	47.98	1.47	48
49	48.99	0.86	48.99	1.07	48.98	1.28	48.98	1.50	49
50	49.99	0.87	49.99	1.09	49.98	1.31	49.98	1.53	50
Dist	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist
	89 Deg.		88¾ Deg		88½ Deg		88¼ Deg		

Dist.	1 Deg. Lat.	Dep	1¼ Deg. Lat.	Dep	1½ Deg Lat.	Dep	1¾ Deg Lat.	Dep	Dist.
51	50.99	0.89	50.99	1.11	50.98	1.34	50.98	1.56	51
52	51.99	0.91	51.99	1 13	51.98	1.36	51.98	1.59	52
53	52.99	0.92	52.99	1.16	52.98	1.39	52.98	1.62	53
54	53.99	0.94	53.99	1.18	53.98	1.41	53.97	1.65	54
55	54.99	0.96	54.99	1.20	54.98	1.44	54.97	1.68	55
56	55.99	0.98	55.99	1.22	55.98	1.47	55.97	1.71	56
57	56.99	0.99	56 99	1.24	56.98	1.49	56.97	1.74	57
58	57.99	1.01	57.99	1.27	57.98	1.52	57.97	1.77	58
59	58.99	1.03	58.99	1.29	58.98	1.54	58,97	1.80	59
60	59.99	1.05	59.99	1.31	59.98	1.57	59.97	1.83	60
61	60.99	1.06	60.99	1.33	60.98	1.60	60.97	1.86	61
62	61.99	1·08	61.99	1.35	61.98	1.62	61.97	1.89	62
63	62.99	1.10	62.99	1.37	62.98	1.65	62.97	1.92	63
64	63.99	1.12	63.98	1.40	63.98	1.68	63.97	1.95	64
65	64.99	1.13	64.98	1.42	64.98	1.70	64.97	1.99	65
66	65.99	1.15	65.98	1.44	65.98	1.73	65.97	2.02	66
67	66.99	1.17	66.98	1.46	66.98	1.75	66.97	2.05	67
68	67.99	1.19	67 98	1.48	67.98	1.78	67.97	2.08	68
69	68.99	1.20	68.98	1.51	68.98	1.81	68.97	2.11	69
70	69.99	1.22	69.98	1.53	69.98	1.83	69.97	2.14	70
71	70.99	1.24	70.98	1.55	70.97	1.86	70.97	2.17	71
72	71.99	1.26	71.98	1.57	71.97	1.88	71.97	2.20	72
73	72.99	1.27	72.98	1.59	72.97	1.91	72.97	2.23	73
74	73.99	1.29	73.98	1.61	73.97	1.94	73.97	2.26	74
75	74.99	1.31	74.98	1.64	74.97	1.96	74.97	2.29	75
76	75.99	1.33	75.98	1.66	75.97	1.99	75.96	2.32	76
77	76.99	1.34	76.98	1.68	76.97	2.02	76.96	2.35	77
78	77.99	1.36	77.98	1.70	77.97	2.04	77.96	2.38	78
79	78.99	1.38	78.98	1.72	78.97	2.07	78.96	2.41	79
80	79.99	1.40	79.98	1.75	79.97	2.09	79.96	2.44	80
81	80.99	1.41	80.98	1.77	80.97	2.12	80.96	2.47	81
82	81.99	1.43	81.98	1.79	81.97	2.15	81.96	2.50	82
83	82.99	1.45	82.98	1.81	82.97	2.17	82.96	2.53	83
84	83.99	1.47	83.98	1.83	83.97	2.20	83.96	2.57	84
85	84.99	1.48	84.98	1.85	84.97	2.23	84.96	2.60	85
86	85.99	1.50	85.98	1.88	85.97	2.25	85.96	2.63	86
87	86.99	1.52	86.98	1.90	86.97	2.28	86.96	2.66	87
88	87.99	1.54	87.98	1.92	87.97	2.30	87.96	2.69	88
89	88.99	1.55	88.98	1 94	88.97	2.33	88.96	3.72	89
90	89.99	1.57	89.98	1.96	89.97	2.36	89.96	2.75	90
91	90.99	1.59	90.98	1.99	90.97	2.38	90.96	2.78	91
92	91.99	1.61	91.98	2.01	91.97	2.41	91.96	2.81	92
93	92.99	1.62	92.98	2.03	92.97	2.43	92.96	2.84	93
94	93.99	1.64	93.98	2.05	93.97	2.46	93.96	2.87	94
95	94.99	1.66	94.98	2.07	94.97	2.49	94.96	2.90	95
96	95.99	1.68	95.98	2.09	95.97	2.51	95.96	2.94	96
97	96.99	1.69	96.98	2.12	96.97	2.54	96.95	2.96	97
98	97.99	1 71	97.98	2.14	97.97	2.57	97.95	2.99	98
99	98.98	1.73	98·98	2.16	98.97	2.59	98.95	3.02	99
100	99 98	1.75	99.98	2.18	99.97	2.62	99.95	3.05	100
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	89° Deg.		88¾ Deg		88½ Deg		88¼ Deg		
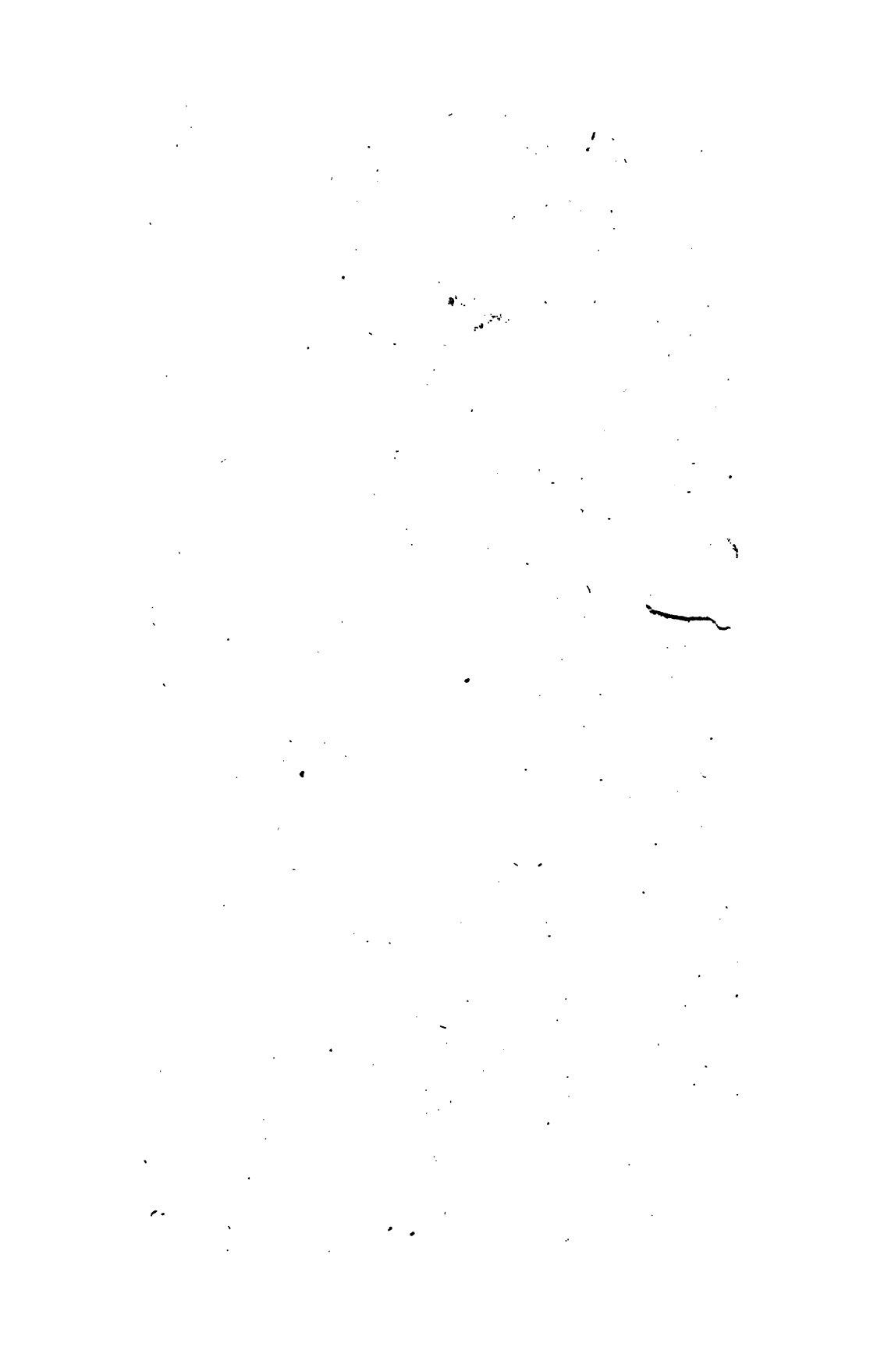
Dist.	2 Deg. Lat.	Dep	2¼ Deg. Lat.	Dep	2½ Deg. Lat.	Dep	2¾ Deg. Lat.	Dep	Dist.
1	1.00	0.03	1.00	0.04	1.00	0.04	1.00	0.05	1
2	2.00	0.07	2.00	0.08	2.00	0.09	2.00	0.10	2
3	3.00	0.10	3.00	0.12	3.00	0.13	3.00	0.14	3
4	4.00	0.14	4.00	0.16	4.00	0.17	4.00	0.19	4
5	5.00	0.17	5.00	0.20	5.00	0.22	4.99	0.24	5
6	6.00	0.21	6.00	0.24	5.99	0.26	5.99	0.29	6
7	7.00	0.24	6.99	0.27	6.99	0.31	6.99	0.34	7
8	7.99	0.28	7.99	0.31	7.99	0.35	7.99	0.38	8
9	8.99	0.31	8.99	0.35	8.99	0.39	8.99	0.43	9
10	9.99	0.35	9.99	0.39	9.99	0.44	9.99	0.48	10
11	10.99	0.38	10.99	0.43	10.99	0.48	10.99	0.53	11
12	11.99	0.42	11.99	0.47	11.99	0.52	11.99	0 58	12
13	12.99	0.45	12.99	0.51	12.99	0.57	12.99	0.62	13
14	13.99	0.49	13.99	0.55	13.99	0.61	13 98	0.67	14
15	14.99	0.52	14.99	0.59	14.99	0.65	14.98	0.72	15
16	15.99	0.56	15.99	0.63	15.99	0.70	15.98	0.77	16
17	16.99	0.59	16.99	0.67	16.98	0.74	16.98	0.82	17
18	17.99	0.63	17.99	0.71	17.98	0.79	17.98	0.86	18
19	18.99	0.66	18.99	0.75	18.98	0.83	18.98	0.91	19
20	19.99	0.70	19.98	0.79	19.98	0.87	19.98	0.96	20
21	20.99	0.73	20.98	0.82	20.98	0.92	20.98	1.01	21
22	21.99	0.77	21.98	0.86	21.98	0.96	21.97	1.06	22
23	22.99	0.80	22.98	0.90	22.98	1.00	22.97	1.10	23
24	23.99	0.84	23.98	0.94	23 98	1.05	23.97	1.15	24
25	24.98	0.87	24.98	0.98	24.98	1.09	24.97	1.20	25
26	25.98	0.91	25.98	1.02	25.98	1.13	25.97	1.25	26
27	26.98	0.94	26.98	1.06	26.97	1.18	26.97	1.30	27
28	27.98	0.98	27.98	1.10	27.97	1.22	27.97	1.34	28
29	28.98	1.01	28.98	1.14	28.97	1.26	28.97	1.39	29
30	29.98	1.05	29.98	1.18	29.97	1.31	29.97	1.44	30
31	30.98	1.08	30.98	1.22	30.97	1.35	30.96	1.49	31
32	31.98	1.12	31.98	1.26	31.97	1.40	31.96	1.54	32
33	32.98	1.15	32.97	1.30	32.97	1.44	32.96	1.58	33
34	33.98	1.19	33.97	1.33	33.97	1.48	33.96	1.63	34
35	34.98	1.22	34.97	1.37	34.97	1.53	34.96	1.68	35
36	35.98	1.26	35.97	1.41	35.97	1.57	35.96	1.73	36
37	36.98	1.29	36.97	1.45	36.96	1.61	36.96	1.78	37
38	37.98	1.33	37.97	1.49	37.96	1.66	37.96	1.82	38
39	38.98	1.36	38.97	1.53	38.96	1.70	38 96	1 87	39
40	39.98	1.40	39.97	1.57	39.96	1.75	39.95	1.92	40
41	40.98	1.43	40.97	1.61	40.96	1.77	40.95	1.97	41
42	41.97	1.47	41.97	1.65	41.96	1.83	41.95	2.02	42
43	42.97	1.50	42.97	1.69	42.96	1.88	42.95	2.06	43
44	43.97	1.54	43.97	1.73	43.96	1.92	43.95	2.11	44
45	44.97	1.57	44.97	1.77	44.96	1.96	44.95	2.16	45
46	45.97	1.61	45.96	1.81	45.96	2.01	45.95	2.21	46
47	46.97	1.64	46.96	1.85	46.96	2.05	46.95	2.25	47
48	47.97	1.68	47.96	1.88	47 95	2.09	47.95	2.30	48
49	48.97	1.71	48.96	1.92	48.95	2.14	48.94	2.35	49
50	49.97	1.74	49.96	1.96	49.95	2.18	49.94	2.40	50
Dist.	Dep.	Lat	Dep.	Lat	Dep	Lat	Dep	Lat	Dist.
	88 Deg.		87¾ Deg		87½ Deg		87¼ Deg		

Dist.	2 Deg. Lat.	Dep	2¼ Deg. Lat.	Dep	2½ Deg. Lat.	Dep	2¾ Deg Lat.	Dep	Dist.
51	50.97	1.78	50.96	2.00	50.95	2.22	50.94	2.45	51
52	51.97	1.81	51.96	2.04	51.95	2.27	51.94	2.50	52
53	52.97	1.85	52.96	2.08	52.95	2.31	52.94	2.54	53
54	53.97	1.88	53.96	2.12	53.95	2.36	53.94	2.59	54
55	54.97	1.92	54.96	2.16	54.95	2.40	54.94	2.64	55
56	55.97	1.95	55.96	2.20	55.95	2.44	55.94	2.69	56
57	56.97	1.99	56.96	2.24	56.95	2.49	56.93	2.73	57
58	57.96	2.02	57.96	2.28	57.94	2.53	57.93	2.78	58
59	58.96	2.06	58.95	2.32	58.94	2.57	58.93	2.83	59
60	59.96	2.09	59.95	2.36	59.94	2.62	59.93	2.88	60
61	60.96	2.13	60.95	2.39	60.94	2.66	60.93	2.93	61
62	61.96	2.16	61.95	2.43	61.94	2.70	61.93	2.97	62
63	62.96	2.20	62.95	2.47	62.94	2.75	62.93	3.02	63
64	63.96	2.23	63.95	2.51	63.94	2.79	63.93	3.07	64
65	64.96	2.27	64.95	2.55	64.94	2.84	64.93	3.12	65
66	65.96	2.30	65.95	2.59	65.94	2.88	65.92	3.17	66
67	66.96	2.34	66.95	2.63	66.94	2.92	66.92	3.21	67
68	67.96	2.37	67.95	2.67	67.94	2.97	67.92	3.26	68
69	68.96	2.41	68.95	2.71	68.93	3.01	68.92	3.31	69
70	69.96	2.44	69.95	2.75	69.93	3.05	69.92	3.36	70
71	70.96	2.48	70.95	2.79	70.93	3.10	70.92	3.41	71
72	71.96	2.51	71.94	2.83	71.93	3.14	71.92	3.45	72
73	72.96	2.55	72.94	2.87	72.93	3.18	72.92	3.50	73
74	73.95	2.58	73.94	2.91	73.93	3.23	73.91	3.55	74
75	74.95	2.62	74.94	2.94	74.93	3.27	74.91	3.60	75
76	75.95	2.65	75.94	2.98	75.93	3.31	75.91	3.65	76
77	76.95	2.69	76.94	3.02	76.93	3.36	76.91	3.70	77
78	77.95	2.72	77.94	3.06	77.93	3.40	77.91	3.74	78
79	78.95	2.76	78.94	3.10	78.92	3.45	78.91	3.79	79
80	79.95	2.79	79.94	3.14	79.92	3.49	79.91	3.84	80
81	80.95	2.83	80.94	3.18	80.92	3.53	80.91	3.89	81
82	81.95	2.86	81.94	3.22	81.92	3.58	81.91	3.93	82
83	82.95	2.90	82.94	3.26	82.92	3.62	82.90	3.98	83
84	83.95	2.93	83.94	3.30	83.92	3.66	83.90	4.03	84
85	84.95	2.97	84.93	3.34	84.92	3.71	84.90	4.08	85
86	85.95	3.00	85.93	3.38	85.92	3.75	85.90	4.13	86
87	86.95	3.04	86.93	3.42	86.92	3.79	86.90	4.17	87
88	87.95	3.07	87.93	3.45	87.92	3.84	87.90	4.22	88
89	88.95	3.11	88.93	3.49	88.92	3.88	88.90	4.27	89
90	89.95	3.14	89.93	3.53	89.91	3.93	89.90	4.32	90
91	90.95	3.18	90.93	3.57	90.91	3.97	90.90	4.37	91
92	91.94	3.21	91.93	3.61	91.91	4.01	91.89	4.41	92
93	92.94	3.25	92.93	3.65	92.91	4.06	92.89	4.46	93
94	93.94	3.28	93.93	3.69	93.91	4.10	93.89	4.51	94
95	94.94	3.32	94.93	3.73	94.91	4.14	94.89	4.56	95
96	95.94	3.35	95.93	3.77	95.91	4.19	95.89	4.61	96
97	96.94	3.39	96.93	3.81	96.91	4.23	96.89	4.65	97
98	97.94	3.42	97.92	3.85	97.91	4.27	97.89	4.70	98
99	98.94	3.46	98.92	3.89	98.91	4.32	98.89	4.75	99
100	99.94	3.49	99.92	3.93	99.91	4.36	99.89	4.80	100
Dist.	Dep.	Lat.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	88 Deg.		87¾ Deg		87½ Deg		87¼ Deg		

Dist.	3 Deg. Lat.	Dep	3¼ Deg. Lat.	Dep	3½ Deg. Lat.	Dep	3¾ Deg. Lat.	Dep	Dist.
1	1.00	0.05	1.00	0.06	1.00	0.06	1.00	0.06	1
2	2.00	0.10	2.00	0.11	2.00	0.12	2.00	0.13	2
3	3.00	0.16	3.00	0.17	2.99	0.18	2.99	0.20	3
4	3.99	0.21	3.99	0.23	3.99	0.24	3.99	0.26	4
5	4.99	0.26	4.99	0.28	4.99	0.31	4.99	0.33	5
6	5.99	0.31	5.99	0.34	5.99	0.37	5.99	0.39	6
7	6.99	0.37	6.99	0.40	6.99	0.43	6.99	0.46	7
8	7.99	0.42	7.99	0.45	7.99	0.49	7.98	0.52	8
9	8.99	0.47	8.99	0.51	8.98	0.55	8.98	0.59	9
10	9.99	0.52	9.98	0.57	9.98	0.61	9.98	0.65	10
11	10.98	0.58	10.98	0.62	10.98	0.67	10.98	0.72	11
12	11.98	0.63	11.98	0.68	11.98	0.73	11.97	0.78	12
13	12.98	0.68	12.98	0.73	12.98	0.79	12.97	0.85	13
14	13.98	0.73	13.98	0.79	13.97	0.85	13.97	0.92	14
15	14.98	0.79	14.98	0.85	14.97	0.92	14.97	0.98	15
16	15.98	0.84	15.97	0.91	15.97	0.98	15.97	1.05	16
17	16.98	0.89	16.97	0.96	16.97	1.04	16.96	1.11	17
18	17.98	0.94	17.97	1.02	17.97	1.10	17.96	1.18	18
19	18.98	0.99	18.97	1.08	18.96	1.16	18.96	1.24	19
20	19.97	1.05	19.97	1.13	19.96	1.22	19.96	1.31	20
21	20.97	1.10	20.97	1.19	20.96	1.28	20.96	1.37	21
22	21.97	1.15	21.96	1.25	21.96	1.34	21.95	1.44	22
23	22.97	1.20	22.96	1.30	22.96	1.40	22.95	1.50	23
24	23.97	1.26	23.96	1.36	23.96	1.47	23.95	1.57	24
25	24.97	1.31	24.96	1.42	24.95	1.53	24.95	1.64	25
26	25.96	1.36	25.96	1.47	25.95	1.59	25.94	1.70	26
27	26.96	1.41	26.96	1.53	26.95	1.65	26.94	1.77	27
28	27.96	1.47	27.95	1.59	27.95	1.71	27.94	1.83	28
29	28.96	1.52	28.95	1.64	28.95	1.77	28.94	1.90	29
30	29.96	1.57	29.95	1.70	29.94	1.83	29.94	1.96	30
31	30.96	1.62	30.95	1.76	30.94	1.89	30.93	2.03	31
32	31.96	1.67	31.95	1.81	31.94	1.95	31.93	2.09	32
33	32.95	1.73	32.95	1.87	32.94	2.01	32.93	2.16	33
34	33.95	1.78	33.95	1.93	33.94	2.08	33.93	2.22	34
35	34.95	1.83	34.94	1.98	34.93	2.14	34.92	2.29	35
36	35.95	1.88	35.94	2.04	35.93	2.20	35.92	2.35	36
37	36.95	1.94	36.94	2.10	36.93	2.26	36.92	2.42	37
38	37.95	1.99	37.94	2.15	37.93	2.32	37.92	2.49	38
39	38.95	2.04	38.94	2.21	38.93	2.38	38.92	2.55	39
40	39.95	2.09	39.94	2.27	39.93	2.44	39.91	2.62	40
41	40.94	2.15	40.93	2.32	40.92	2.50	40.91	2.68	41
42	41.94	2.20	41.93	2.38	41.92	2.56	41.91	2.75	42
43	42.94	2.25	42.93	2.44	42.92	2.63	42.91	2.81	43
44	43.94	2.30	43.93	2.49	43.92	2.69	43.91	2.88	44
45	44.94	2.36	44.93	2.55	44.92	2.75	44.90	2.94	45
46	45.94	2.41	45.93	2.61	45.91	2.81	45.90	3.01	46
47	46.94	2.46	46.92	2.66	46.91	2.87	46.90	3.07	47
48	47.93	2.51	47.92	2.72	47.91	2.93	47.90	3.14	48
49	48.93	2.56	48.92	2.78	48.91	2.99	48.90	3.20	49
50	49.93	2.62	49.92	2.83	49.91	3.05	49.89	3.27	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	87 Deg.		86¾ Deg		86½ Deg		86¼ Deg		

Dist.	3 Deg.		3¼ Deg.		3½ Deg.		3¾ Deg.		Dist
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
51	50.93	2.67	50.92	2.89	50.90	3.11	50.89	3.34	51
52	51.93	2.72	51.92	2.95	51.90	3.17	51.89	3.40	52
53	52.93	2.77	52.91	3.00	52.90	3.24	52.89	3.47	53
54	53.93	2.83	53.91	3.06	53.90	3.30	53.88	3.53	54
55	54.92	2.88	54.91	3.12	54.90	3.36	54.88	3.60	55
56	55.92	2.93	55.91	3.17	55.90	3.42	55.88	3.66	56
57	56.92	2.98	56.91	3.23	56.89	3.48	56.88	3.73	57
58	57.92	3.04	57.91	3.29	57.89	3.54	57.88	3.79	58
59	58.92	3.09	58.91	3.34	58.89	3.60	58 87	3.86	59
60	59.92	3.14	59.90	3.40	59.89	3.66	59.87	3.92	60
61	60.92	3.19	60.90	3.46	60.98	3.72	60 87	3.99	61
62	61.92	3.24	61.90	3.51	61·88	3.79	61.87	4.05	62
63	62.91	3.30	62.90	3.57	62.88	3.85	62.87	4.12	63
64	63.91	3.35	63.90	3.63	63.88	3.91	63.86	4.19	64
65	64.91	3.40	64.90	3.69	64.88	3.97	64.86	4.25	65
66	65.91	3.45	65.89	3.74	65.88	4.03	65.86	4.32	66
67	66.91	3.51	66.89	3.80	66.88	4.09	66.86	4.38	67
68	67.91	3.56	67.89	3.86	67.87	4.15	67.85	4.45	68
69	68.91	3.61	68.89	3.91	68.87	4.21	68.85	4.51	69
70	69.91	3.66	69.89	3.97	69.87	4.27	69.85	4.58	70
71	70.90	3.72	70.89	4.03	70.87	4.33	70.85	4.64	71
72	71.90	3.77	71.88	4.08	71.87	4.40	71.85	4.71	72
73	72.90	3.82	72.88	4.14	72.86	4.46	72.84	4.77	73
74	73.90	3.87	73.88	4.20	73.86	4.52	73.84	4.84	74
75	74.90	3.93	74.88	4.25	74.86	4.58	74.84	4.91	75
76	75.90	3.98	75.88	4.31	75.86	4.64	75.84	4.97	76
77	76.89	4.03	76.88	4.37	76.86	4.70	76.84	5.04	77
78	77.89	4.08	77.87	4.42	77.85	4.76	77.83	5.10	78
79	78.89	4.13	78.87	4.48	78.85	4.82	78.83	5.17	79
80	79.89	4.19	79.87	4.54	79.85	4.88	79.83	5.23	80
81	80.89	4.24	80.87	4.59	80.85	4.94	80.83	5.30	81
82	81.89	4.29	81 87	4.65	81.85	5.01	81.82	5.36	82
83	82.89	4.34	82.87	4.71	82.85	5.07	82.82	5.43	83
84	83.89	4.40	83.86	4.76	83.84	5.13	83.82	5.49	84
85	84.88	4.45	84.86	4.82	84.84	5.19	84.82	5.56	85
86	85.88	4.50	85.86	4.88	85.84	5.25	85.82	5.62	86
87	86 88	4.55	86.86	4.93	86.84	5.31	86.81	5.69	87
88	87.88	4.61	87.86	4.99	87.84	5.37	87.81	5.76	88
89	88.88	4.66	88.86	5.05	88.83	5.43	88.81	5.82	89
90	89.88	4.71	89.86	5.10	89.83	5.49	89.81	5.89	90
91	90.88	4.76	90.85	5.16	90.83	5.56	90.81	5.95	91
92	91.87	4.81	91.85	5.22	91.83	5.62	91.80	6.02	92
93	92.87	4.87	92.85	5.27	92.83	5.68	92.80	6.08	93
94	93.87	4.92	93.85	5.33	93.82	5.74	93.80	6.15	94
95	94.87	4.97	94.85	5.39	94.82	5.80	94.80	6.21	95
96	95.87	5.02	95.85	5.44	95.82	5.86	95.79	6.28	96
97	96.87	5.08	96.84	5.50	96.82	5.92	96.79	6.34	97
98	97.87	5.13	97.84	5.56	97.82	5.98	97.79	6.41	98
99	98.86	5.18	98.84	5.61	98.82	6.04	98.79	6.47	99
100	99.86	5.23	99.84	5.67	99.81	6.10	99.79	6.54	100
Dist	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist
	87 Deg		86¾ Deg		86½ Deg		86¼ Deg		

Dist.	4 Deg. Lat	Dep	4¼ Deg. Lat	Dep	4½ Deg. Lat	Dep	4¾ Deg. Lat	Dep	Dist.
1	1.00	0.07	1.00	0.07	1.00	0.08	1.00	0.08	1
2	2.00	0.14	1.99	0.15	1.99	0.16	1.99	0.17	2
3	2.99	0.21	2.99	0.22	2.99	0.24	2.99	0.25	3
4	3.99	0.28	3.99	0.30	3.99	0.31	3.98	0.33	4
5	4.99	0.35	4.99	0.37	4.98	0.39	4.98	0.41	5
6	5.99	0.42	5.98	0.44	5.98	0.47	5.98	0.50	6
7	6.98	0.49	6.98	0.55	6.98	0.54	6.97	0.58	7
8	7.98	0.56	7.98	0.59	7.97	0.63	7.97	0.66	8
9	8.98	0.63	8.98	0.67	8.97	0.71	8.97	0.75	9
10	9.98	0.70	9.97	0.74	9 97	0.78	9·97	0.83	10
11	10.97	0.77	10.97	0.82	10.97	0.86	10.96	0.91	11
12	11.97	0.84	11.97	0.89	11.96	0.94	11.96	0.99	12
13	12.97	0.91	12.96	0.96	12.96	1.02	12.96	1.08	13
14	13.97	0.98	13.96	1·04	13.96	1.10	13.95	1.16	14
15	14.96	1.05	14.96	1.11	14.95	1.18	14.95	1.24	15
16	15.96	1.12	15.96	1.19	15.95	1.26	15.95	1.32	16
17	16.96	1.19	16.95	1.26	16.95	1.33	16.94	1.41	17
18	17.96	1.26	17.95	1.33	17.94	1.41	17.94	1.49	18
19	18.95	1.33	18.95	1.40	18.94	1.49	18.93	1.57	19
20	19.95	1.40	19.95	1.48	19.94	1.57	19.93	1.66	20
21	20.95	1.46	20.94	1.56	20.94	1.65	20.93	1.74	21
22	21.95	1.53	21.94	1.63	21.93	1.73	21.92	1.82	22
23	22.94	1.60	22.94	1.70	22.93	1.80	22.92	1.90	23
24	23.94	1.67	23.93	1.78	23.93	1.88	23.92	1.99	24
25	24.94	1.74	24.93	1.85	24.92	1.96	24.91	2.07	25
26	25.94	1.81	25.93	1.93	25.92	2.04	25.91	2.15	26
27	26.93	1.88	26.93	2.00	26.92	2.12	26.91	2.24	27
28	27.93	1.95	27.92	2.08	27.91	2.20	27.90	2.32	28
29	28.93	2.02	28.92	2 15	28.91	2.28	28.90	2.40	29
30	29.93	2.09	29.92	2.22	29.91	2.35	29.90	2.48	30
31	30.92	2.16	30.91	2 30	30.90	2.43	30.89	2.57	31
32	31.92	2.23	31.91	2.37	31.90	2.51	31.89	2.65	32
33	32.92	2.30	32.91	2.45	32.90	2.59	32.89	2.73	33
34	33.92	2.37	33.91	2.52	33.90	2.67	33.88	2.82	34
35	34.91	2.44	34.90	2.59	34.89	2.75	34.88	2.90	35
36	35.91	2.51	35.90	2.67	35.89	2.82	35.88	2.98	36
37	36.91	2.58	36 90	2.74	36.89	2.90	36.87	3.06	37
38	37.91	2.65	37.90	2.82	37.88	2.98	37.87	3.15	38
39	38.90	2.72	38.89	2.89	38.88	3.06	38.87	3.23	39
40	39.90	2.79	39.89	2.96	39.88	3.14	39.86	3.31	40
41	40.90	2.86	40.89	3.04	40.87	3.22	40.86	3.40	41
42	41.90	2.93	41.88	3.11	41.87	3.30	41.86	3.48	42
43	42.90	3.00	42.88	3.19	42.87	3.37	42.85	3.56	43
44	43.89	3.07	43.88	3.26	43.86	3.45	43.85	3.64	44
45	44.89	3.14	44.88	3.33	44.86	3.53	44.85	3.73	45
46	45.89	3.21	45.87	3.41	45.86	3.61	45.84	3.81	46
47	46.89	3.28	46.87	3.48	46.86	3.69	46.84	3.89	47
48	47.88	3.35	47.87	3.56	47.85	3.77	47.84	3.97	48
49	48.88	3.42	48.87	3.63	48.85	3.84	48.83	4.06	49
50	49.88	3.49	49.86	3.71	49.85	3.92	49.83	4.14	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	86 Deg.		85¾ Deg		85½ Deg		85¼ Deg		

Dist	4 Deg.		4¼ Deg.		4½ Deg.		4¾ Deg.		Dist
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat	Dep	
51	50.88	3.56	50.86	3.78	50.84	4.00	50.82	4.22	51
52	51.87	3.63	51.86	3.85	51.84	4.08	51.82	4.31	52
53	52.87	3.70	52.85	3.93	52.84	4.16	52.82	4.39	53
54	53.87	3.77	53.85	4.00	53.83	4.24	53.81	4.47	54
55	54.87	3.84	54.85	4.08	54.83	4.32	54.81	4.55	55
56	55.86	3.91	55.85	4.15	55.83	4.39	55.81	4.64	56
57	56.86	3.98	56.84	4.22	56.82	4.47	56.80	4.72	57
58	57.86	4.05	57.84	4.30	57.82	4.55	57.80	4.80	58
59	58.86	4.12	58.84	4.37	58.82	4.63	58.80	4.89	59
60	59.85	4.19	59.84	4.45	59.82	4.71	59.79	4.97	60
61	60.85	4.26	60.83	4.52	60.81	4.79	60.79	5.05	61
62	61.85	4.32	61.83	4.59	61·81	4.86	61.79	5.13	62
63	62.85	4.39	62.83	4.67	62.81	4.94	62.78	5.22	63
64	63.84	4.46	63.82	4.74	63.80	5.02	63.78	5.30	64
65	64.84	4.53	64.82	4.82	64.80	5.10	64.78	5.38	65
66	65.84	4.60	65.82	4.89	65.80	5.18	65.77	5.47	66
67	66.84	4.67	66.82	4.97	66.79	5.26	66.77	5.55	67
68	67.83	4.74	67.81	5.04	67.79	5.34	67.77	5.63	68
69	68.83	4.81	68.81	5.11	68.79	5.41	68.76	5.71	69
70	69.83	4.88	69.81	5.19	69.78	5.49	69.76	5.80	70
71	70.83	4.95	70.80	5.26	70.78	5 55	70.76	5.88	71
72	71.82	5.02	71 80	5.34	71.78	5.67	71.75	5.96	72
73	72.82	5.09	72.80	5.41	72.77	5.73	72.75	6.04	73
74	73.82	5.16	73.80	5.48	73.77	5.81	73.75	6.13	74
75	74.82	5.23	74.79	5.56	74.77	5.88	74.74	6.21	75
76	75.81	5.30	75.79	5.63	75.77	5.96	75.74	6.29	76
77	76.81	5.37	76.79	5.71	76.76	6.04	76.74	6.38	77
78	77.81	5.44	77.79	5.78	77.76	6.12	77.73	6.46	78
79	78.81	5.51	78.78	5.85	78.76	6.20	78.73	6.54	79
80	79.81	5.58	79.78	5.93	79.75	6.28	79.73	6.62	80
81	80.80	5.65	80.78	6.00	80.75	6.36	80.72	6.71	81
82	81.80	5.72	81 78	6.08	81.75	6.43	81.72	6.79	82
83	82.80	5.79	82.77	6.15	82.74	6.51	82.71	6.87	83
84	83.80	5.86	83.77	6.23	83.74	6.59	83.71	6.96	84
85	84.79	5.93	84.77	6.30	84.74	6.67	84.71	7.04	85
86	85.79	6.00	85.76	6.37	85.73	6.75	85.70	7.12	86
87	86 79	6.07	86.76	6.45	86.73	6.83	86.70	7.20	87
88	87.79	6.17	87.76	6.52	87.73	6.90	87.70	7.29	88
89	88.78	6.21	88.76	6.60	88.73	6.98	88.70	7.37	89
90	89.78	6.28	89.75	6.67	89.72	7.06	89.69	7.45	90
91	90.78	6.35	90.75	6.74	90.72	7.14	90.69	7.54	91
92	91.78	6.42	91.75	6.82	91.72	7.22	91.68	7.62	92
93	92.77	6.49	92.74	6.89	92.71	7.30	92.68	7.70	93
94	93.77	6.56	93.74	6.97	93.71	7.38	93.68	7.78	94
95	94.77	6.63	94.74	7.04	94.71	7.45	94.67	7.86	95
96	95.77	6.70	95.74	7.11	95.70	7.53	95.67	7.95	96
97	96.76	6.77	96.73	7.19	96.70	7.61	96.67	8.03	97
98	97.76	6.84	97.73	7.26	97.70	7.69	97.66	8.12	98
99	98.76	6.91	98.73	7.34	98.69	7.77	98.66	8.20	99
100	99.76	6.98	99.73	7.41	99.69	7.85	99.66	8.28	100
Dist	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist
	86 Deg.		85¾ Deg		85½ Deg		85¼ Deg		

1 B

Dist	5 Deg. Lat	5 Deg. Dep	5¼ Deg. Lat	5¼ Deg. Dep	5½ Deg. Lat	5½ Deg. Dep	5¾ Deg. Lat	5¾ Deg. Dep	Dist
1	1.00	0.09	1.00	0.09	1.00	0.10	0.99	0.10	1
2	1.99	0.17	1.99	0.18	1.99	0.19	1.99	0.20	2
3	2.99	0.26	2.99	0.27	2.99	0.29	2.98	0.30	3
4	3.98	0.35	3.98	0.37	3.98	0.38	3.98	0.40	4
5	4.98	0.44	4.98	0.46	4.98	0.48	4.97	0.50	5
6	5.98	0.52	5.97	0.55	5.97	0.58	5.97	0.60	6
7	6.97	0.61	6.97	0.64	6.97	0.67	6.96	0.70	7
8	7.97	0.70	7.97	0.73	7.96	0.76	7.96	0.80	8
9	8.97	0.78	8.96	0.82	8.96	0.86	8.95	0.90	9
10	9.96	0.87	9.96	0.92	9.95	0.96	9.95	1.00	10
11	10.96	0.96	10.95	1.01	10.95	1.05	10.94	1.10	11
12	11.95	1.05	11.95	1.10	11.94	1.15	11.94	1.20	12
13	12.95	1.13	12.95	1.19	12.94	1.25	12.93	1.30	13
14	13.95	1.22	13.94	1.28	13.94	1.34	13.93	1.40	14
15	14.94	1.31	14.94	1.37	14.93	1.44	14.92	1.50	15
16	15.94	1.39	15.93	1.46	15.93	1.53	15.92	1.60	16
17	16.94	1.48	16.93	1.56	16.92	1.63	16.91	1.70	17
18	17.93	1.57	17.92	1.65	17.92	1.73	17.91	1.80	18
19	18.93	1.66	18.92	1.74	18.91	1.82	18.90	1.90	19
20	19.92	1.74	19.92	1.83	19.91	1.92	19.90	2.00	20
21	20.92	1.83	20.91	1.92	20.90	2.01	20.89	2.10	21
22	21.92	1.92	21.91	2.01	21.90	2.11	21.89	2.20	22
23	22.91	2.00	22.90	2.10	22.89	2.20	22.88	2.30	23
24	23.91	2.09	23.90	2.20	23.89	2.30	23.88	2.40	24
25	24.90	2.18	24.90	2.29	24.88	2.40	24.87	2.50	25
26	25.90	2.27	25.89	2.38	25.88	2.49	25.87	2.60	26
27	26.90	2.35	26.89	2.47	26.88	2.59	26.86	2.71	27
28	27.89	2.44	27.88	2.56	27.87	2.68	27.86	2.81	28
29	28.89	2.53	28.88	2.65	28.87	2.78	28.85	2.91	29
30	29.89	2.61	29.87	2.75	29.86	2.88	29.85	3.01	30
31	30.88	2.70	30.87	2.84	30.86	2.97	30.84	3.11	31
32	31.88	2.79	31.87	2.93	31.85	3.07	31.84	3.21	32
33	32.87	2.88	32.86	3.02	32.85	3.16	32.83	3.31	33
34	33.87	2.96	33.86	3.11	33.84	3.26	33.83	3.41	34
35	34.87	3.05	34.85	3.20	34.84	3.35	34.82	3.51	35
36	35.86	3.14	35.85	3.29	35.83	3.45	35.82	3.61	36
37	36.86	3.22	36.84	3.39	36.83	3.55	36.81	3.71	37
38	37.86	3.31	37.84	3.48	37.83	3.64	37.81	3.81	38
39	38.85	3.40	38.84	3.57	38.82	3.74	38.80	3.91	39
40	39.85	3.49	39.83	3.66	39.82	3.83	39.80	4.01	40
41	40.84	3.57	40.83	3.75	40.81	3.93	40.79	4.11	41
42	41.84	3.66	41.82	3.84	41.81	4.03	41.79	4.21	42
43	42.84	3.75	42.82	3.93	42.80	4.12	42.78	4.31	43
44	43.83	3.83	43.82	4.03	43.80	4.22	43.78	4.41	44
45	44.83	3.92	44.81	4.12	44.79	4.31	44.77	4.51	45
46	45.82	4.01	45.81	4.21	45.79	4.41	45.77	4.61	46
47	46.82	4.10	46.80	4.30	46.78	4.50	46.76	4.71	47
48	47.82	4.18	47.80	4.39	47.78	4.60	47.76	4.81	48
49	48.81	4.27	48.79	4.48	48.77	4.70	48.75	4.91	49
50	49.81	4.36	49.79	4.58	49.77	4.79	49.75	5.01	50
Dist	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist
	85 Deg.		84¾ Deg		84½ Deg		84¼ Deg		

Dist.	5 Deg.		5¼ Deg.		5½ Deg		5¾ Deg		Dist.
	Lat.	Dep.	Lat.	Dep	Lat.	Dep	Lat.	Dep.	
51	50.81	4.44	50.79	4.67	50.77	4.89	50.74	5.11	51
52	51.80	4.53	51.78	4.76	51.76	4.98	51.74	5.21	52
53	52.80	4.62	52.78	4.85	52.76	5.08	52.73	5.31	53
54	53.79	4.71	53.77	4.94	53.75	5.18	53.73	5.41	54
55	54.79	4.79	54.77	5.03	54.75	5.27	54.72	5.51	55
56	55.79	4.88	55.77	5.12	55.74	5.37	55.72	5.61	56
57	56.78	4.97	56.76	5.22	56.74	5.46	56.71	5.71	57
58	57.78	5.06	57.76	5.31	57.73	5.56	57.71	5.81	58
59	58.78	5.14	58.75	5.40	58.73	5.65	58.70	5.91	59
60	59.77	5.23	59.75	5.49	59.72	5.75	59.70	6.01	60
61	60.77	5.32	60.74	5.58	60.72	5.85	60.69	6.11	61
62	61.76	5.40	61.74	5.67	61.71	5.94	61.69	6.21	62
63	62.76	5.49	62.74	5.76	62.71	6.04	62.68	6.31	63
64	63.76	5.58	63.73	5.86	63.71	6·13	63.68	6.41	64
65	64.75	5.67	64.73	5.95	64.70	6.23	64.67	6.51	65
66	65.75	5.75	65.72	6.04	65.70	6.33	65.67	6.61	66
67	66.75	5.84	66.72	6.13	66.69	6.42	66.66	6.71	67
68	67.74	5.93	67 71	6.22	67.69	6.52	67.66	6.81	68
69	68.74	6.01	68.71	6.31	68.68	6.61	68.65	6.91	69
70	69.73	6.10	69.71	6.41	69.68	6.71	69.65	7.01	70
71	70.73	6.19	70.70	6.50	70.67	6.81	70.64	7.11	71
72	71.73	6.28	71.67	6.59	71.67	6.90	71.64	7.21	72
73	72.72	6.36	72.69	6.68	72.66	7.00	72.63	7.31	73
74	73.72	6.45	73.69	6.77	73.66	7.09	73.63	7.41	74
75	74.71	6.54	74.69	6.86	74.65	7.19	74.62	7.51	75
76	75.71	6.62	75.68	6.95	75.65	7.28	75.62	7.61	76
77	76.71	6.71	76.68	7.05	76.65	7.38	76.61	7.71	77
78	77.70	6.80	77.67	7.14	77.64	7.48	77.61	7.81	78
79	78.70	6.89	78.67	7.23	78.64	7.57	78.60	7.91	79
80	79.70	6.97	79.66	7.32	79.63	7.67	79.60	8.02	80
81	80.69	7.06	80.66	7.41	80.63	7.76	80.59	8.12	81
82	81.69	7.15	81.66	7.50	81.62	7.86	81.59	8.22	82
83	82.68	7·23	82.65	7.59	82.62	7.96	82.58	8.32	83
84	83.68	7·32	83.65	7.69	83.61	8.05	83.58	8.42	84
85	84.68	7.41	84.64	7.78	84.61	8.15	84.57	8.52	85
86	85.67	7.50	85.64	7.87	85.60	8.24	85.57	8.62	86
87	86.67	7.58	86.64	7.96	86.60	8.34	86.56	8.72	87
88	87.67	7.67	87.63	8.05	87.59	8.44	87.56	8.82	88
89	88.66	7 76	88.63	8 14	88.59	8.53	88.55	8.92	89
90	89.66	7.84	89.62	8.24	89.59	8.63	89.55	9.02	90
91	90.65	7.93	90.62	8.33	90.58	8.72	90.54	9.12	91
92	91.65	8.02	91.61	8.42	91.58	8.82	91.54	9.22	92
93	92.65	8.11	92.61	8.51	92.57	8.91	92.53	9.32	93
94	93.64	8.19	93.61	8.60	93.57	9.01	93.53	9.42	94
95	94 64	8.28	94.60	8.69	94.56	9.11	94.52	9.52	95
96	95.63	8.37	95.60	8.78	95.56	9.20	95.52	9.62	96
97	96.63	8.45	96.59	8.88	96.55	9.30	96.51	9.72	97
98	97.63	8.54	97.59	8.97	97.55	9.39	97.51	9.82	98
99	98.62	8.63	98·59	9.06	98.54	9.49	98.50	9.92	99
100	99 62	8.72	99.59	9.15	99.54	9.58	99.50	10.02	100
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat.	Dist.
	85 Deg.		84¾ Deg		84½ Deg		84¼ Deg.		

Dist.	6 Deg.		6¼ Deg.		6½ Deg.		6¾ Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat	Dep	Lat.	Dep	
1	0.99	0.10	0.99	0.11	0.99	0.11	0.99	0.12	1
2	1.99	0.21	1.99	0.22	1.99	0.23	1.99	0.24	2
3	2.98	0.31	2.98	0.33	2.98	0.34	2.98	0.35	3
4	3.98	0.41	3.98	0.44	3.97	0.45	3.97	0.47	4
5	4.97	0.52	4.97	0.54	4.97	0.57	4.97	0.59	5
6	5.97	0.63	5.96	0.65	5.96	0.68	5.96	0.71	6
7	6.96	0.73	6.96	0.76	6.96	0.79	6.95	0.82	7
8	7.96	0.84	7.95	0.87	7.95	0.91	7.94	0.94	8
9	8.95	0.94	8.95	0.98	8.94	1.02	8.94	1.06	9
10	9.95	1.05	9.94	1.09	9.94	1.13	9.93	1.18	10
11	10.94	1.15	10.93	1.20	10.93	1.25	10.92	1.29	11
12	11.93	1.25	11.93	1.31	11.92	1.36	11.92	1.41	12
13	12.93	1.36	12.92	1.42	12.92	1.47	12.91	1.53	13
14	13.92	1.46	13.92	1.52	13.91	1.59	13.90	1.65	14
15	14.92	1.57	14.91	1.63	14.90	1.70	14.90	1.76	15
16	15.91	1.67	15.90	1.74	15.90	1.81	15.89	1.88	16
17	16.91	1.78	16.90	1.85	16.89	1.92	16.88	2.00	17
18	17.90	1.88	17.89	1.96	17.88	2.04	17.88	2.12	18
19	18.90	1.99	18.89	2.07	18.88	2.15	18.87	2.23	19
20	19.89	2.09	19.88	2.18	19.87	2.26	19.86	2.35	20
21	20.88	2.20	20.88	2.29	20.87	2.38	20.85	2.47	21
22	21.88	2.30	21.87	2.40	21.86	2.49	21.85	2.59	22
23	22.87	2.40	22.86	2.50	22.85	2.60	22.84	2.70	23
24	23.87	2.51	23.86	2.61	23.85	2.72	23.83	2.82	24
25	24.86	2.61	24.85	2.72	24.84	2.83	24.83	2.94	25
26	25.86	2.72	25.85	2.83	25.83	2.94	25.82	3.06	26
27	26.85	2.82	26.84	2.94	26.83	3.06	26.81	3.17	27
28	27.85	2.93	27.83	3.05	27.82	3.17	27.81	3.29	28
29	28.84	3.03	28.83	3.16	28.81	3.28	28.80	3.41	29
30	29.84	3.14	29.82	3.27	29.81	3.40	29.79	3.53	30
31	30.83	3.24	30.82	3.37	30.80	3.51	30.79	3.64	31
32	31.82	3.34	31.81	3.48	31.79	3.62	31.78	3.76	32
33	32.82	3.45	32.80	3.59	32.79	3.74	32.77	3.88	33
34	33.81	3.55	33.80	3.70	33.78	3.85	33.76	4.00	34
35	34.81	3.66	34.79	3.81	34.78	3.96	34.76	4.11	35
36	35.80	3.76	35.79	3.92	35.77	4.08	35.75	4.23	36
37	36.80	3.87	36.78	4.03	36.76	4.19	36.75	4.35	37
38	37.79	3.97	37.77	4.14	37.76	4.30	37.74	4.47	38
39	38.79	4.08	38.77	4.25	38.75	4.41	38.73	4.58	39
40	39.78	4.18	39.76	4.35	39.74	4.53	39.72	4.70	40
41	40.78	4.29	40.76	4.46	40.74	4.64	40.72	4.82	41
42	41.77	4.39	41.75	4.57	41.73	4.76	41.71	4.94	42
43	42.76	4.49	42.74	4.68	42.72	4.87	42.70	5.05	43
44	43.76	4.60	43.74	4.79	43.72	4.98	43.70	5.17	44
45	44.75	4.70	44.73	4.90	44.71	5.09	44.69	5.29	45
46	45.75	4.81	45.73	5.01	45.70	5.21	45.68	5.41	46
47	46.74	4.91	46.72	5.12	46.70	5.32	46.67	5.52	47
48	47.74	5.02	47.71	5.23	47.69	5.43	47.67	5.64	48
49	48.73	5.12	48.71	5.34	48.69	5.55	48.66	5.76	49
50	49.73	5.23	49.70	5.44	49.68	5.66	49.65	5.88	50
	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	84 Deg.		83¾ Deg		83½ Deg		83¼ Deg		

Dist.	6 Deg.		6¼ Deg		6½ Deg.		6¾ Deg		Dist.
	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50.72	5.33	50.70	5.55	50.67	5.77	50.65	5.99	51
52	51.72	5.44	51.69	5.66	51.67	5.89	51.64	6.11	52
53	52.71	5.54	52.68	5.77	52.66	6.00	52.63	6.23	53
54	53.70	5.64	53.68	5.88	53.65	6.11	53.63	6.35	54
55	54.70	5.75	54.67	5.99	54.65	6.23	54.62	6.46	55
56	55.69	5.85	55.67	6.10	55.64	6.34	55.61	6.58	56
57	56.69	5.96	56.66	6.21	56.63	6.45	56.60	6.70	57
58	57.68	6.06	57.66	6.31	57.63	6.57	57.60	6.82	58
59	58.68	6.17	58.65	6.42	58.62	6.68	58.59	6.93	59
60	59.67	6.27	59.64	6.53	59.61	6.79	59.58	7.05	60
61	60.67	6.38	60.64	6.64	60.61	6.91	60.58	7.17	61
62	61.66	6.48	61.63	6.75	61.60	7.02	61.57	7.29	62
63	62.65	6.59	62.63	6.86	62.60	7.13	62.56	7.40	63
64	63.65	6.69	63.62	6.97	63.59	7.25	63.56	7.52	64
65	64.64	6.79	64.61	7.08	64.58	7.36	64.55	7.64	65
66	65.64	6.90	65.61	7.19	65.58	7.47	65.54	7.76	66
67	66.63	7.00	66.60	7.29	66.57	7.58	66.54	7.88	67
68	67.63	7.11	67.60	7.40	67.56	7.70	67.53	7.99	68
69	68.62	7.21	68.59	7.51	68.56	7.81	68.52	8.11	69
70	69.62	7.32	69.58	7.62	69.55	7.92	69.51	8.23	70
71	70.61	7.42	70.58	7.73	70.54	8.04	70.51	8.35	71
72	71.61	7.53	71.57	7.84	71.54	8.15	71.50	8.46	72
73	72.60	7.63	72.57	7.95	72.53	8.26	72.49	8.58	73
74	73.59	7.74	73.56	8.06	73.52	8.38	73.49	8.70	74
75	74.59	7.84	74.55	8.17	74.52	8.49	74.48	8.82	75
76	75.58	7.94	75.55	8.27	75.51	8.60	75.47	8.93	76
77	76.58	8.05	76.54	8.38	76.51	8.72	76.47	9.05	77
78	77.57	8.15	77.54	8.49	77.50	8.83	77.46	9.17	78
79	78.57	8.26	78.53	8.60	78.49	8.94	78.45	9.29	79
80	79.56	8.36	79.53	8.71	79.49	9.06	79.45	9.40	80
81	80.56	8.47	80.52	8.82	80.48	9.17	80.44	9.52	81
82	81.55	8.57	81.51	8.93	81.47	9.28	81.43	9.64	82
83	82.55	8.68	82.51	9.04	82.47	9.40	82.42	9.76	83
84	83.54	8.78	83.50	9.14	83.46	9.51	83.42	9.87	84
85	84.53	8.88	84.50	9.25	84.45	9.62	84.41	9.99	85
86	85.53	8.99	85.49	9.36	85.45	9.74	85.40	10.11	86
87	86.52	9.09	86.48	9.47	86.44	9.85	86.40	10.23	87
88	87.52	9.20	87.48	9.58	87.43	9.96	87.39	10.34	88
89	88.51	9.30	88.47	9.69	88.43	10.08	88.38	10.46	89
90	89.51	9.41	89.47	9.80	89.42	10.19	89.38	10.58	90
91	90.50	9.51	90.46	9.91	90.42	10.30	90.37	10.70	91
92	91.50	9.62	91.45	10 02	91.41	10.41	91.36	10.81	92
93	92.49	9.72	92.45	10.12	92.40	10.53	92.36	10.93	93
94	93.49	9.83	93.44	10.23	93.40	10.64	93.35	11.05	94
95	94.48	9.93	94.44	10.34	94.39	10.75	94.34	11.17	95
96	95.47	10.03	95.43	10.45	95.38	10.87	95.33	11.28	96
97	96.47	10.14	96.42	10.56	96.38	10.98	96.33	11.40	97
98	97.46	10.24	97.42	10.67	97.37	11.09	97.32	11.52	98
99	98.46	10.35	98.41	10.78	98.36	11.21	98.31	11.64	99
100	99.45	10.45	99.41	10 89	99.36	11.32	99.31	11.75	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	84 Deg.		83¾ Deg.		83½ Deg.		83¼ Deg		

Dist.	7 Deg.		7¼ Deg.		7½ Deg.		7¾ Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	0.99	0.12	0.99	0.13	0.99	0.13	0.99	0.13	1
2	1.99	0.24	1.98	0.25	1.98	0.26	1.98	0.27	2
3	2.98	0.37	2.98	0.38	2.97	0.39	2.97	0.40	3
4	3.97	0.49	3.97	0.50	3.97	0.52	3.96	0.54	4
5	4.96	0.61	4.96	0.63	4.96	0.65	4.95	0:67	5
6	5.96	0.73	5.95	0.76	5.95	0.78	5.95	0.81	6
7	6.95	0.85	6.94	0.88	6.94	0.91	6.94	0.94	7
8	7.94	0.97	7.94	1.01	7.93	1.04	7.93	1.08	8
9	8.93	1.10	8.93	1.14	8.92	1.17	8.92	1.21	9
10	9.93	1.22	9.92	1.26	9 91	1.31	9·91	1.35	10
11	10.92	1.34	10.91	1.39	10.91	1.44	10.90	1.48	11
12	11.91	1.46	11.90	1.51	11.90	1.57	11.89	1.62	12
13	12.90	1.58	12.90	1.64	12.89	1.70	12.88	1.75	13
14	13.90	1.71	13.89	1.77	13.88	1.83	13.87	1.89	14
15	14.89	1.83	14.88	1.89	14.87	1.96	14.86	2.02	15
16	15.88	1.95	15.87	2.02	15.86	2.09	15.85	2.16	16
17	16.87	2.07	16.86	2.15	16.85	2.22	16.84	2.29	17
18	17.86	2.19	17.86	2.27	17.85	2.35	17.84	2.43	18
19	18.85	2.32	18.85	2.40	18.84	2.48	18.83	2.56	19
20	19.85	2.44	19.84	2 52	19.83	2.61	19.82	2.70	20
21	20.84	2.56	20.83	2.65	20.82	2.74	20.81	2.83	21
22	21.84	2.68	21.82	2.78	21.81	2.87	21.80	2.97	22
23	22.83	2.80	22.82	2.90	22.80	3.00	22.79	3.10	23
24	23.82	2.92	23.81	3.03	23.79	3.13	23.78	3.24	24
25	24.81	3.05	24.80	3.15	24.79	3.26	24.77	3.37	25
26	25.81	3.17	25.79	3.28	25.78	3.39	25.76	3.51	26
27	26.80	3.29	26.78	3.41	26.77	3.52	26.75	3.64	27
28	27.79	3.41	27.78	3.53	27.76	3.65	27.74	3.78	28
29	28.78	3.53	28.77	3.66	28.75	3.79	28.74	3.91	29
30	29.78	3.66	29.76	3.79	29.74	3.92	29.73	4.05	30
31	30.77	3.78	30.75	3.91	30.73	4.05	30.72	4.18	31
32	31.76	3.90	31.74	4.04	31.73	4.18	31.71	4.32	32
33	32.75	4.02	32.74	4.16	32.72	4.31	32.70	4.45	33
34	33.75	4.14	33.73	4.29	33.71	4.44	33.69	4.58	34
35	34.74	4.27	34.72	4.42	34.70	4.57	34.68	4.72	35
36	35.73	4.39	35.71	4.54	35.69	4.70	35.67	4.85	36
37	36.72	4.51	36 70	4.67	36.68	4.83	36.66	4.99	37
38	37.72	4.63	37.70	4.80	37.67	4.96	37.65	5.12	38
39	38.71	4.75	38.69	4.92	38.67	5.09	38.64	5.26	39
40	39.70	4.87	39.68	5.05	39.66	5.22	39.63	5.39	40
41	40.70	5.00	40.67	5.17	40.65	5.35	40.63	5.53	41
42	41.69	5.12	41.66	5.30	41.64	5.48	41.62	5.66	42
43	42.68	5.24	42.66	5.43	42.63	5.61	42.61	5.80	43
44	43.67	5.36	43.65	5.55	43.62	5.74	43.60	5.93	44
45	44.67	5.48	44.64	5.68	44.62	5.87	44.59	6.07	45
46	45.66	5.61	45.63	5.81	45.61	6.00	45.58	6.20	46
47	46.65	5.73	46.62	5.93	46.60	6.13	46.57	6.34	47
48	47.64	5.85	47.62	6.06	47.59	6.27	47.56	6.47	48
49	48.63	5.97	48.61	6.18	48.58	6.40	48.55	6.61	49
50	49.63	6.09	49.60	6.31	49.57	6.53	49.54	6.74	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	83 Deg.		82¾ Deg		82½ Deg		82¼ Deg		

Dist.	7 Deg.		7¼ Deg.		7½ Deg.		7¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50.62	6.22	50.59	6.44	50.56	6.66	50.53	6.88	51
52	51.61	6.34	51.58	6.56	51.56	6.79	51.53	7.01	52
53	52.60	6.46	52.58	6.69	52.55	6.92	52.52	7.15	53
54	53.60	6.58	53.57	6.81	53.54	7.05	53.51	7.28	54
55	54.59	6.70	54.56	6.94	54.53	7.18	54.50	7.42	55
56	55.58	6.82	55.55	7.07	55.52	7.31	55.49	7.55	56
57	56.58	6.95	56.54	7.19	56.51	7.44	56.48	7.69	57
58	57.57	7.07	57.54	7.32	57.50	7.57	57.47	7.82	58
59	58.56	7.19	58.53	7.45	58.50	7.70	58.46	7.96	59
60	59.55	7.31	59.52	7.57	59.49	7.83	59.45	8.09	60
61	60.55	7.43	60.51	7.70	60.48	7.96	60.44	8.23	61
62	61.54	7.56	61.50	7.82	61.47	8.09	61.43	8.36	62
63	62.53	7.68	62.50	7.95	62.46	8.22	62.42	8.50	63
64	63.52	7.80	63.49	8.08	63.45	8.35	63.42	8.63	64
65	64.52	7.92	64.48	8.20	64.44	8.48	64.41	8.77	65
66	65.51	8.04	65.47	8.33	65.44	8.61	65.40	8.90	66
67	66.50	8.17	66.46	8.46	66.43	8.75	66.39	9.04	67
68	67.49	8.29	67.46	8.58	67.42	8.88	67.38	9.17	68
69	68.49	8.41	68.45	8.71	68.41	9.01	68.37	9.30	69
70	69.48	8.53	69.44	8.83	69.40	9.14	69.36	9.44	70
71	70.47	8.65	70.43	8.96	70.39	9.27	70.35	9.57	71
72	71.46	8.77	71.42	9.09	71.38	9.40	71.34	9.71	72
73	72.46	8.90	72.42	9·21	72.38	9.53	72.33	9.84	73
74	73.45	9.02	73.41	9.34	73.37	9.66	73.32	9.98	74
75	74.44	9.14	74.40	9.46	74.36	9.79	74.31	10.11	75
76	75.43	9.26	75.39	9.59	75.35	9.92	75.31	10.25	76
77	76.43	9.38	76.38	9.72	76.34	10.05	76.30	10.38	77
78	77.42	9.51	77.38	9.84	77.33	10.18	77.29	10.52	78
79	78.41	9.63	78.37	9.97	78.32	10.31	78.28	10.65	79
80	79.40	9.75	79.36	10.10	79.32	10.44	79.27	10.79	80
81	80.40	9.87	80.35	10.22	80.31	10.57	80.26	10.92	81
82	81.39	9.99	81.34	10.35	81.30	10.70	81.25	11.06	82
83	82.38	10.12	82.34	10.47	82.29	10.83	82.24	11.19	83
84	83.37	10.24	83.33	10.60	83.28	10.96	83.23	11.33	84
85	84.37	10.36	84.32	10.73	84.27	11.09	84.22	11.46	85
86	85.36	10.48	85.31	10.85	85.26	11.23	85.21	11.60	86
87	86.35	10.60	86.30	10.98	86.26	11.36	86.21	11.73	87
88	87.34	10.72	87.30	11.11	87.25	11.49	87.20	11.87	88
89	88.34	10.85	88.29	11.23	88.24	11.62	88.19	12.00	89
90	89.33	10.97	89.28	11.36	89.23	11.75	89.18	12.14	90
91	90.32	11.09	90.27	11.48	90.22	11.88	90.17	12.27	91
92	91.31	11.21	91.26	11.61	91.21	12.01	91.16	12.41	92
93	92.31	11.33	92.26	11.74	92.20	12.14	92.15	12.54	93
94	93.30	11.46	93.25	11.86	93.20	12.27	93.14	12.68	94
95	94.29	11.58	94.24	11.99	94.19	12.40	94.13	12.81	95
96	95.28	11.70	95.23	12.12	95.18	12.53	95.12	12.95	96
97	96.28	11.82	96.22	12.24	96.17	12.66	96.11	13.08	97
98	97.27	11.94	97.22	12.37	97.16	12.79	97.10	13.22	98
99	98.26	12.07	98.21	12.49	98.15	12.92	98.10	13.35	99
100	99.25	12.19	99.20	12.62	99.14	13.05	99.09	13.49	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	83 Deg.		82¾ Deg.		82½ Deg.		82¼ Deg.		

Dist.	8 Deg. Lat.	8 Deg. Dep	8¼ Deg. Lat.	8¼ Deg. Dep	8½ Deg. Lat.	8½ Deg. Dep	8¾ Deg. Lat.	8¾ Deg. Dep	Dist.
1	0.99	0.14	0.99	0.14	0.99	0.15	0.99	0.15	1
2	1.98	0.28	1.98	0.29	1.98	0.30	1.98	0.30	2
3	2.97	0.42	2.97	0.43	2.97	0.44	2.97	0.46	3
4	3.96	0.56	3.96	0.57	3.96	0.59	3.95	0.61	4
5	4.95	0.70	4.95	0.72	4.95	0.74	4.94	0.76	5
6	5.94	0.84	5.94	0.86	5.93	0.89	5.93	0.91	6
7	6.93	0.97	6.93	1.00	6.92	1.03	6.92	1.06	7
8	7.92	1.11	7.92	1.15	7.91	1.18	7.91	1.22	8
9	8.91	1.25	8.91	1.29	8.90	1.33	8.90	1.37	9
10	9.90	1.39	9.90	1.43	9.89	1.48	9.88	1.52	10
11	10.89	1.53	10.89	1.58	10.88	1.63	10.87	1.67	11
12	11.88	1.67	11.88	1.72	11.87	1.77	11.86	1.83	12
13	12.87	1.81	12.87	1.87	12.86	1.92	12.85	1.98	13
14	13.86	1.95	13.86	2.01	13.85	2.07	13.84	2.13	14
15	14.85	2.04	14.85	2.15	14.84	2.22	14.83	2.28	15
16	15.84	2.23	15.84	2.30	15.82	2.36	15.81	2.43	16
17	16.83	2.32	16.83	2.44	16.81	2.51	16.80	2.59	17
18	17.82	2.51	17.81	2.58	17.80	2.66	17.79	2.74	18
19	18.82	2.64	18.80	2.73	18.79	2.81	18.78	2.89	19
20	19.81	2.78	19.79	2.87	19.78	2.96	19.77	3.04	20
21	20.80	2.92	20.78	3.01	20.77	3.10	20.76	3.19	21
22	21.79	3.06	21.77	3.16	21.76	3.25	21.74	3.35	22
23	22.78	3.20	22.76	3.30	22.75	3.40	22.73	3.50	23
24	23.77	3.34	23.75	3.44	23.74	3.55	23.72	3.65	24
25	24.76	3.48	24.74	3.59	24.73	3.70	24.71	3.80	25
26	25.75	3.62	25.73	3.73	25.71	3.84	25.70	3.96	26
27	26.74	3.76	26.72	3.87	26.70	3.99	26.69	4.11	27
28	27.73	3.90	27.71	4.02	27.69	4.14	27.67	4.26	28
29	28.72	4.04	28.70	4.16	28.68	4.29	28.66	4.41	29
30	29.71	4.18	29.69	4.30	29.67	4.43	29·65	4.56	30
31	30.70	4.31	30.68	4.45	30.66	4.58	30.64	4.72	31
32	31.69	4.45	31.67	4.59	31.65	4.73	31.63	4.87	32
33	32.68	4.59	32.66	4.74	32.64	4.88	32.62	5.02	33
34	33.67	4.73	33.65	4.88	33.63	5.03	33.60	5.17	34
35	34.66	4.87	34.64	5.02	34.62	5.17	34.59	5.32	35
36	35.65	5.01	35.63	5.17	35.60	5.32	35.58	5.48	36
37	36.64	5.15	36.62	5.31	36.59	5.47	36.57	5.63	37
38	37.63	5.29	37.61	5.45	37.58	5.62	37.56	5.78	38
39	38.62	5.43	38.60	5.60	38.57	5.76	38.55	5.93	39
40	39.61	5.57	39.59	5.74	39.56	5.91	39.53	6.08	40
41	40.60	5.71	40.58	5.88	40.55	6.06	40.52	6.24	41
42	41.59	5.85	41.57	6.03	41.54	6.21	41.51	6.39	42
43	42.58	5.98	42.56	6.17	42.53	6.36	42.50	6.54	43
44	43.57	6.12	43.54	6.31	43.52	6.50	43.49	6.69	44
45	44.56	6.26	44.53	6.46	44.51	6.65	44.48	6.85	45
46	45.55	6.40	45.52	6.60	45.49	6.80	45.46	7.00	46
47	46.54	6.54	46.51	6.74	46.48	6.95	46.45	7.15	47
48	47.53	6.68	47.50	6.89	47.47	7.09	47.44	7.30	48
49	48.52	6.82	48.49	7.03	48.46	7.24	48.43	7.45	49
50	49.51	6.96	49.48	7.17	49.45	7.39	49.42	7.61	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	82 Deg.		81¾ Deg		81½ Deg		81¼ Deg		

Dist.	8 Deg. Lat.	Dep.	8¼ Deg. Lat.	Dep.	8½ Deg. Lat.	Dep.	8¾ Deg. Lat.	Dep.	Dist.
51	50.50	7.10	50.47	7.32	50.44	7.54	50.41	7.76	51
52	51.49	7.24	51.46	7.46	51.43	7.69	51.39	7.91	52
53	52.48	7.38	52.45	7.61	52.42	7.83	52.38	8.06	53
54	53.47	7.52	53.44	7.75	53.41	7.98	53.37	8.21	54
55	54.46	7.65	54.43	7.89	54.40	8.13	54.36	8.37	55
56	55.46	7.79	55.42	8.04	55.38	8.28	55.35	8.52	56
57	56.45	7.93	56.41	8.18	56.37	8.43	56.34	8.67	57
58	57.44	8.07	57.40	8.32	57.36	8.57	57.32	8.82	58
59	58.43	8.21	58.39	8.47	58.35	8.72	58.31	8.98	59
60	59.42	8.35	59.38	8.61	59.34	8.87	59.30	9.13	60
61	60.41	8.49	60.37	8.75	60.33	9.02	60.29	9.28	61
62	61.40	8.63	61.36	8.90	61.32	9.16	61.28	9.43	62
63	62.39	8.77	62.35	9.04	62.31	9.31	62.27	9.58	63
64	63.38	8.91	63.34	9·18	63.30	9.46	63.26	9.74	64
65	64.37	9.05	64.35	9.33	64.29	9.61	64.24	9.89	65
66	65.36	9.19	65.32	9.47	65.28	9.76	65.23	10.04	66
67	66.35	9.32	66.31	9.61	66.26	9.90	66.22	10.19	67
68	67.34	9.46	67.30	9.76	67.25	10.05	67.21	10.34	68
69	68.33	9.60	68.29	9.90	68.24	10.20	68.20	10.50	69
70	69.32	9.74	69.28	10.04	69.23	10.35	69.19	10.64	70
71	70.31	9.88	70.27	10.19	70.22	10.49	70.17	10.80	71
72	71.30	10.02	71.25	10.33	71.21	10.64	71.16	10.95	72
73	72.29	10.16	72.24	10.47	72.20	10.79	72.15	11.10	73
74	73.28	10.30	73.23	10.62	73.19	10.94	73.14	11.26	74
75	74.27	10.44	74.22	10.76	74.18	11.09	74.13	11.41	75
76	75.26	10.58	75.21	10.91	75.17	11.23	75.12	11.56	76
77	76.25	10.72	76.20	11.05	76.15	11.38	76.10	11.71	77
78	77.24	10.86	77.19	11.19	77.14	11.53	77.09	11.87	78
79	78.23	10.99	78.18	11.34	78.13	11.68	78.08	12.02	79
80	79.22	11.13	79.17	11.48	79.12	11.82	79.07	12.17	80
81	80.21	11.27	80.16	11.62	80.11	11.97	80.06	12.32	81
82	81.20	11.41	81.15	11.77	81.10	12.12	81.05	12.47	82
83	82.19	11.55	82.14	11.91	82.09	12.27	82.03	12.63	83
84	83.18	11.69	83.13	12.05	83.08	12.42	83.02	12.78	84
85	84.17	11.83	84.12	12.20	84.07	12.56	84.01	12.93	85
86	85.16	11.97	85.11	12.34	85.06	12.71	85.00	13.08	86
87	86.15	12.11	86.10	12.48	86.04	12.86	85.99	13.23	87
88	87.14	12.25	87.09	12.63	87.03	13.01	86.98	13.39	88
89	88.13	12.39	88.08	12.77	88.02	13.16	87.96	13.54	89
90	89.12	12.53	89.07	12.91	89.01	13.30	88.95	13.69	90
91	90.11	12.66	90.06	13.06	90.00	13.45	89.94	13.84	91
92	91.10	12.80	91.05	13.20	90.99	13.60	90.93	14.00	92
93	92.09	12.94	92.04	13.34	91.98	13.75	91.92	14.15	93
94	93.09	13.08	93.03	13.49	92.97	13.89	92.91	14.30	94
95	94.08	13.22	94.02	13.63	93.96	14.04	93.89	14.45	95
96	95.07	13.36	95.01	13.78	94.95	14.19	94.88	14.60	96
97	96.06	13.50	96.00	13.92	95.93	14.34	95.87	14.76	97
98	97.05	13.64	96.99	14.06	96.92	14.49	96.86	14.91	98
99	98.04	13.78	97.98	14.21	97.91	14.63	97.85	15.06	99
100	99.03	13.92	98.97	14.35	98.90	14.78	98.84	15.21	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	82 Deg.		81¾ Deg.		81½ Deg		81¼ Deg		

1 C

Dist.	9 Deg.		9½ Deg.		9¼ Deg.		9¾ Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	
1	0.99	0.16	0.99	0.16	0.99	0.17	0.99	0.17	1
2	1.98	0.31	1.97	0.32	1.97	0.33	1.97	0.34	2
3	2.96	0.47	2.96	0.48	2.96	0.50	2.96	0.51	3
4	3.95	0.63	3.95	0.64	3.95	0.66	3.94	0.68	4
5	4.94	0.78	4.93	0.80	4.93	0.83	4.93	0.85	5
6	5.93	0.94	5.92	0.96	5.92	0.99	5.91	1.02	6
7	6.91	1.10	6.91	1.13	6.90	1.16	6.90	1.19	7
8	7.90	1.25	7.90	1.29	7.89	1.32	7.88	1.35	8
9	8.89	1.41	8.88	1.45	8.88	1.49	8.87	1.52	9
10	9.88	1.56	9.87	1.61	9.86	1.65	9.86	1.69	10
11	10.86	1.72	10.86	1.77	10.85	1.82	10.84	1.86	11
12	11.85	1.88	11.84	1.93	11.84	1.98	11.83	2.03	12
13	12.84	2.03	12.83	2.09	12.82	2.15	12.81	2.20	13
14	13.83	2.19	13.82	2.25	13.81	2.31	13.80	2.37	14
15	14.82	2.35	14.80	2.41	14.79	2.48	14.78	2.54	15
16	15.80	2.50	15.79	2.57	15.78	2.64	15.77	2.71	16
17	16.79	2.66	16.78	2.73	16.77	2.81	16.75	2.88	17
18	17.78	2.82	17.77	2.89	17.75	2.97	17.74	3.05	18
19	18.77	2.97	18.75	3.05	18.74	3.14	18.73	3.22	19
20	19.75	3.13	19.74	3.21	19.73	3.30	19.71	3.39	20
21	20.74	3.29	20.73	3.38	20.71	3.47	20.70	3.56	21
22	21.73	3.44	21.71	3.54	21.70	3.63	21.68	3.73	22
23	22.72	3.60	22.70	3.70	22.68	3.80	22.67	3.90	23
24	23.70	3.75	23.69	3.86	23.67	3.96	23.65	4.06	24
25	24.69	3.91	24.67	4.02	24.66	4.13	24.64	4.23	25
26	25.68	4.07	25.66	4.18	25.64	4.29	25.62	4.40	26
27	26.67	4.22	26.65	4.34	26.63	4.46	26.61	4.57	27
28	27.66	4.38	27.64	4.50	27.62	4.62	27.60	4.74	28
29	28.64	4.54	28.62	4.66	28.60	4.79	28.58	4.91	29
30	29.63	4.69	29.61	4.82	29.59	4.95	29.57	5.08	30
31	30.62	4.85	30.60	4.98	30.57	5.12	30.55	5.25	31
32	31.61	5.01	31.58	5.14	31.56	5.28	31.54	5.42	32
33	32.59	5.16	32.57	5.30	32.55	5.45	32.52	5.59	33
34	33.58	5.32	33.56	5.47	33.53	5.61	33.51	5.76	34
35	34.57	5.48	34.54	5.63	34.52	5.78	34.49	5.93	35
36	35.56	5.63	35.53	5.79	35.51	5.94	35.48	6.10	36
37	36.54	5.79	36.52	5.95	36.49	6.11	36.47	6.27	37
38	37.53	5.94	37.51	6.11	37.48	6.27	37.45	6.44	38
39	38.52	6.10	38.49	6.27	38.47	6.44	38.44	6.60	39
40	39.51	6.26	39.48	6.43	39.45	6.60	39.42	6.77	40
41	40.50	6.41	40.47	6.59	40.44	6.77	40.41	6.94	41
42	41.48	6.57	41.45	6.75	41.42	6.92	41.39	7.11	42
43	42.47	6.73	42.44	6.91	42.41	7.10	42.38	7.28	43
44	43.46	6.88	43.43	7.07	43.40	7.26	43.36	7.45	44
45	44.45	7.04	44.41	7.23	44.38	7.43	44.35	7.62	45
46	45.43	7.20	45.40	7.39	45.37	7.59	45.34	7.79	46
47	46.42	7.35	46.39	7.55	46.36	7.76	46.32	7.96	47
48	47.41	7.51	47.38	7.72	47.34	7.92	47.31	8.13	48
49	48.40	7.67	48.36	7.88	48.33	8.09	48.29	8.30	49
50	49.38	7.82	49.35	8.04	49.32	8.25	49.28	8.47	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
	81 Deg.		80¾ Deg.		80½ Deg.		80¼ Deg.		

Dist.	9 Deg. Lat.	9 Deg. Dep	9¼ Deg Lat.	9¼ Deg Dep.	9½ Deg Lat.	9½ Deg Dep.	9¾ Deg Lat.	9¾ Deg Dep.	Dist.
51	50.37	7.98	50.34	8.20	50.30	8.42	50.26	8.64	51
52	51.36	8.13	51.32	8.36	51.29	8.58	51.25	8.81	52
53	52.35	8.29	52.31	8.52	52.27	8.75	52.23	8.98	53
54	53.34	8.45	53.30	8.68	53.26	8.91	53.22	9.14	54
55	54.32	8.60	54.28	8.84	54.25	9.08	54.21	9.31	55
56	55.31	8.76	55.27	9.00	55.23	9.24	55.19	9.48	56
57	56.30	8.92	56.26	9 16	56.22	9.41	56.18	9.65	57
58	57.29	9.07	57.25	9.32	57.20	9.57	57.16	9.82	58
59	58.27	9.23	58.23	9.48	58.19	9.74	58.15	9.99	59
60	59.26	9.39	59.22	9.64	59.18	9.90	59.13	10.16	60
61	60.25	9.54	60.21	9.81	60.16	10.07	60.12	10.33	61
62	61.24	9.70	61.19	9.97	61.15	10.23	61.10	10.50	62
63	62.22	9.86	62.18	10.13	62.14	10.40	62.09	10.67	63
64	63.21	10.01	63.17	10.29	63.12	10.56	63.08	10.84	64
65	64.20	10.17	64.15	10.45	64.11	10.73	64.06	11.01	65
66	65.19	10.32	65.14	10.61	65.09	10.89	65.05	11.18	66
67	66.18	10.48	66.13	10.77	66.08	11.06	66.03	11.35	67
68	67.16	10.64	67.12	10.93	67.07	11.22	67.02	11.52	68
69	68.15	10.79	68.10	11.09	68.05	11.39	68.00	11.69	69
70	69.14	10.95	69.09	11.25	69.04	11.55	68.99	11.85	70
71	70.13	11.11	70.08	11 41	70.05	11.72	69.97	12.02	71
72	71.11	11.26	71.06	11.57	71.01	11.88	70.96	12.19	72
73	72.10	11.42	72.05	11.73	72.00	12.05	71.95	12.36	73
74	73.09	11.58	73.04	11.89	72.99	12.21	72.93	12.53	74
75	74.08	11.73	74.02	12.06	73.97	12.38	73.92	12.70	75
76	75.06	11.89	75.01	12.22	74.96	12.65	74.90	12.87	76
77	76.05	12.05	76.00	12.38	75.94	12.71	75.89	13.04	77
78	77.04	12.20	76.99	12.54	76.93	12.87	76.87	13.21	78
79	78.03	12.36	77.97	12.70	77.92	13.04	77.86	13.38	79
80	79.02	12.51	78.96	12.86	78.90	13.20	78.84	13.55	80
81	80.00	12.67	79.95	13 02	79.89	13.37	79.83	13.72	81
82	80.99	12.83	80.93	13.18	80.88	13.53	80.82	13.89	82
83	81.98	12.98	81.92	13.34	81.86	13.70	81.80	14.06	83
84	82.97	13.14	82.91	13.50	82.85	13.86	82.79	14.23	84
85	83.95	13.30	83.89	13.66	83.83	14.03	83.77	14.39	85
86	84.94	13.45	84.88	13.82	84.82	14.19	84.76	14.56	86
87	85.93	13.61	85.87	13.98	85.81	14.36	85.74	14.73	87
88	86.92	13.77	86.86	14.15	86.79	14.52	86.73	14.90	88
89	87.90	13.92	87.84	14.31	87.78	14.69	87.71	15.07	89
90	88.89	14.08	88.83	14 47	88.77	14.85	88.70	15.24	90
91	89.88	14.24	89.82	14.63	89.75	15.02	89.69	15.41	91
92	90.87	14.39	90.80	14.79	90.74	15.18	90.67	15.58	92
93	91.86	14.55	91.79	14.95	91.72	15.35	91.66	15.75	93
94	92.84	14.70	92.78	15.11	92.71	15.51	92.64	15.92	94
95	93.83	14.86	93.76	15.27	93.70	15.68	93.63	16.09	95
96	94.82	15.02	94.75	15.43	94.68	15.84	94.61	16.26	96
97	95.81	15.17	95.74	15.59	95.67	16.01	95.60	16.43	97
98	96.79	15.33	96.73	15.75	96.66	16.17	96.58	16.60	98
99	97.78	15.49	97.71	15.91	97.64	16.34	97.57	16.77	99
100	98.77	15.64	98.70	16.07	98.63	16.50	98.56	16.93	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	81 Deg.		80¾ Deg		80½ Deg.		80¼ Deg.		

Dist.	10 Deg Lat.	Dep	10¼ Deg Lat.	Dep	10½ Deg Lat.	Dep	10¾ Deg Lat.	Dep	Dist
1	0.98	0.17	0.98	0.18	0.98	0.18	0.98	0.19	1
2	1.97	0.35	1.97	0.36	1.97	0.36	1.96	0.37	2
3	2.95	0.52	2.95	0.53	2.95	0.55	2.95	0.56	3
4	3.94	0.69	3.94	0.71	3.93	0.73	3.93	0.75	4
5	4.92	0.87	4.92	0.89	4.92	0.91	4.91	0.93	5
6	5.91	1.04	5.90	1.07	5.90	1.09	5.89	1.12	6
7	6.89	1.22	6.89	1.25	6.88	1.28	6.88	1.31	7
8	7.88	1.39	7.87	1.42	7.87	1.46	7.86	1.49	8
9	8.86	1.56	8.86	1.60	8.85	1.64	8.84	1.68	9
10	9.85	1.74	9.84	1.78	9 83	1.82	9·82	1.87	10
11	10.83	1.91	10.82	1.96	10.82	2.00	10.81	2.05	11
12	11.82	2.08	11 81	2.14	11.80	2.19	11.79	2.24	12
13	12.80	2.26	12.79	2.31	12.78	2.37	12.77	2.42	13
14	13.79	2.43	13.78	2.49	13.77	2.55	13.75	2.61	14
15	14.77	2.60	14.76	2.67	14.75	2.73	14.74	2.80	15
16	15.76	2.78	15.74	2.85	15.73	2.92	15.72	2.98	16
17	16.74	2.95	16.73	3.03	16.72	3.10	16.70	3.17	17
18	17.73	3.13	17.71	3.20	17.70	3.28	17.68	3.36	18
19	18.71	3.30	18.70	3.38	18.68	3.46	18.67	3.54	19
20	19.70	3.47	19.68	3.56	19.67	3.64	19.65	3.73	20
21	20.68	3.65	20.66	3.74	20.65	3.83	20.63	3.92	21
22	21.67	3.82	21.65	3.91	21.63	4.01	21.61	4.10	22
23	22.65	3.99	22.63	4.09	22.61	4.19	22.60	4.29	23
24	23.64	4.17	23.62	4.27	23.60	4.37	23.58	4.48	24
25	24.62	4.34	24.60	4.45	24.58	4.56	24.56	4.66	25
26	25.61	4.51	25.59	4.63	25.56	4.74	25.54	4.85	26
27	26.59	4.69	26.57	4.80	26.55	4.92	26.53	5.04	27
28	27.57	4.86	27.55	4.98	27.53	5.10	27.51	5.22	28
29	28.56	5.04	28.54	5.16	28.51	5.28	28.49	5.41	29
30	29.54	5.21	29.52	5.34	29.50	5.47	29.47	5.60	30
31	30.53	5.38	30.51	5.52	30.48	5.65	30.46	5.78	31
32	31.51	5.56	31.49	5.69	31.46	5.83	31.44	5.97	32
33	32.50	5.73	32.47	5.87	32.45	6.01	32.42	6.16	33
34	33.48	5.90	33.46	6.05	33.43	6.20	33.40	6.34	34
35	34.47	6.08	34.44	6.23	34.41	6.38	34.39	6.53	35
36	35.45	6.25	35.43	6.41	35.40	6.56	35.37	6.71	36
37	36.44	6.42	36.41	6.58	36.38	6.74	36.35	6.90	37
38	37.42	6.60	37.39	6.76	37.36	6.92	37.33	7.09	38
39	38.41	6.77	38.38	6.94	38.35	7.11	38.32	7.27	39
40	39.39	6.95	39.36	7.12	39.33	7.29	39.30	7.46	40
41	40.38	7.12	40.35	7.30	40.31	7.47	40.28	7.65	41
42	41.36	7.29	41.33	7.47	41.30	7.65	41.26	7.83	42
43	42.35	7.47	42.31	7.65	42.28	7.84	42.25	8.02	43
44	43.33	7.64	43.30	7.83	43.26	8.02	43.23	8.21	44
45	44.32	7.81	44.28	8.01	44.25	8.20	44.21	8.39	45
46	45.30	7.99	45.27	8.19	45.23	8.38	45.19	8.58	46
47	46.29	8.16	46.25	8.36	46.21	8.57	46.18	8.77	47
48	47.27	8.34	47.23	8.54	47.20	8.75	47.16	8.95	48
49	48.26	8.51	48.22	8.72	48.18	8.93	48.14	9.14	49
50	49.24	8.68	49.20	8.90	49.16	9.11	49.12	9.33	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	80 Deg.		79¾ Deg		79½ Deg		79¼ Deg		

Dist	10 Deg. Lat.	Dep.	10¼ Deg. Lat.	Dep.	10½ Deg. Lat.	Dep.	10¾ Deg Lat.	Dep.	Dist
51	50.23	8.86	50.19	9 08	50.15	9.29	50.10	9.51	51
52	51.21	9.03	51.17	9.25	51.13	9.48	51.09	9.70	52
53	52.19	9.20	52.15	9.43	52.11	9.66	52.07	9.89	53
54	53.18	9.38	53.14	9.61	53.10	9.84	53.05	10.07	54
55	54.16	9.55	54.12	9.79	54.08	10.02	54.03	10.26	55
56	55.15	9.72	55.11	9.96	55.06	10.21	55.02	10.45	56
57	56.13	9.90	56.09	10.14	56.05	10.39	56.00	10.63	57
58	57.12	10.07	57.07	10.32	57.03	10.57	56.98	10.82	58
59	58.10	10.25	58.06	10.50	58.01	10.77	57.96	11.00	59
60	59.09	10.42	59.04	10.68	59.00	10.93	58.95	11.19	60
61	60.07	10.59	60.03	10.85	59.98	11.12	59.93	11.38	61
62	61.06	10.77	61.01	11.03	60.96	11.30	60.91	11.56	62
63	62.04	10.94	61.99	11.21	61.95	11.48	61.89	11.75	63
64	63.03	11.11	62.98	11.39	62.93	11.66	62.88	11.94	64
65	64.01	11.29	63.96	11.57	63.91	11.85	63.86	12.12	65
66	65.00	11.46	64.95	11.74	64.89	12.03	64.84	12.31	66
67	65.98	11.63	65.93	11.92	65.88	12.21	65.82	12.50	67
68	66.97	11.81	66.91	12.10	66.86	12.39	66.81	12.68	68
69	67.95	11 98	67 90	12.28	67.84	12.57	67.79	12.87	69
70	68.94	12.16	68.88	12.46	68.83	12.76	68.77	13.06	70
71	69.92	12.33	69.87	12.63	69.81	12.94	69.75	13.24	71
72	70.91	12.50	70.85	12.81	70.79	13.12	70.74	13.43	72
73	71.89	12.68	71.83	12.99	71.78	13.30	71.72	13.62	73
74	72.88	12.85	72.82	13.17	72.76	13.49	72.70	13.80	74
75	73.86	13.02	73.80	13.35	73.74	13.67	73.68	13.99	75
76	74.85	13.20	74.79	13.52	74.73	13.85	74.67	14.18	76
77	75.83	13.37	75.77	13.70	75.71	14.03	75.65	14.36	77
78	76.82	13.54	76.76	13.88	76.69	14·21	76.63	14.55	78
79	77.80	13.72	77.74	14.06	77.68	14.40	77.61	14.74	79
80	78.78	13.99	78.72	14.24	78.66	14.58	78.60	14.92	80
81	79.77	14.07	79.71	14.41	79.64	14.76	79.58	15.11	81
82	80.75	14.24	80.69	14.59	80.63	14.94	80.56	15.29	82
83	81.74	14.41	81.68	14.77	81.61	15.13	81.54	15.48	83
84	82.72	14.59	82.66	14.95	82.59	15.31	82.53	15.67	84
85	83.71	14.76	83.64	15.13	83.58	15.49	83.51	15.85	85
86	84.69	14.93	84.63	15.30	84.56	15.67	84.49	16.04	86
87	85.68	15.11	85.61	15.48	85.54	15.85	85.47	16.23	87
88	86.66	15.28	86.60	15.66	86.53	16.04	86.46	16.41	88
89	87.65	15.45	87.58	15.84	87.51	16.22	87.44	16.60	89
90	88.63	15.63	88.56	16.01	88.49	16.40	88.42	16.79	90
91	89.62	15.80	89.55	16.19	89.48	16.58	89.40	16.97	91
92	90.60	15.98	90.53	16.37	90.46	16.77	90.39	17.16	92
93	91.59	16 15	91.52	16.55	91.44	16.95	91.37	17.35	93
94	92.57	16.32	92.50	16.73	92.43	17.13	92.35	17.53	94
95	93.56	16.50	93.48	16.90	93.41	17.31	93.33	17.72	95
96	94 54	16.67	94.47	17.08	94.39	17.49	94.32	17.91	96
97	95.53	16.84	95.45	17.26	95.38	17.68	95.30	18.09	97
98	96.51	17.02	96.44	17.44	96.36	17.86	96.28	18.28	98
99	97.50	17.19	97.42	17.62	97.34	18.04	97.26	18.47	99
100	98.48	17.36	98.40	17.79	98.33	18.22	98.25	18.65	100
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	80 Deg.		79¾ Deg.		79½ Deg.		79¼ Deg.		

Dist.	11 Deg.		11¼ Deg.		11½ Deg.		11¾ Deg.		Dist.
	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep.	
1	0.98	0.19	0.98	0.20	0.98	0.20	0.98	0.20	1
2	1.96	0.38	1.96	0.39	1.96	0.40	1.96	0.41	2
3	2.94	0.57	2.94	0.59	2.94	0.60	2.94	0.61	3
4	3.93	0.76	3.92	0.78	3.92	0.80	3.92	0.82	4
5	4.91	0.95	4.90	0.98	4.90	1.00	4.90	1.02	5
6	5.89	1.14	5.88	1.17	5.88	1.20	5.87	1.22	6
7	6.87	1.34	6.87	1.37	6.86	1.40	6.85	1.43	7
8	7.85	1.53	7.85	1.56	7.84	1.59	7.83	1.63	8
9	8.83	1.72	8.83	1.76	8.82	1.79	8.81	1.83	9
10	9.82	1.91	9.81	1.95	9.80	1.99	9.79	2.04	10
11	10.80	2.10	10.79	2.15	10.78	2.19	10.77	2.24	11
12	11.78	2.29	11.77	2.34	11.76	2.39	11.75	2.44	12
13	12.76	2.48	12.75	2.54	12.74	2.59	12.73	2.65	13
14	13.74	2.67	13.73	2.73	13.72	2.79	13.71	2.85	14
15	14.72	2.86	14.71	2.93	14.70	2.99	14.69	3.06	15
16	15.71	3.05	15.69	3.12	15.68	3.19	15.66	3.26	16
17	16.69	3.24	16.67	3.32	16.66	3.39	16.64	3.46	17
18	17.67	3.43	17.65	3.51	17.64	3.59	17.62	3.66	18
19	18.65	3.63	18.63	3.71	18.62	3.79	18.60	3.87	19
20	19.63	3.82	19.62	3.90	19.60	3.99	19.58	4.07	20
21	20.61	4.01	20.60	4.10	20.58	4.19	20.56	4.28	21
22	21.60	4.20	21.58	4.29	21.56	4.39	21.54	4.48	22
23	22.58	4.39	22.56	4.49	22.54	4.59	22.52	4.68	23
24	23.56	4.58	23.54	4.68	23.52	4.78	23.50	4.89	24
25	24.54	4.77	24.52	4.88	24.50	4.98	24.48	5.09	25
26	25.52	4.96	25.50	5.07	25.48	5.18	25.46	5.30	26
27	26.50	5.15	26.48	5.27	26.46	5.38	26.43	5.50	27
28	27.49	5.34	27.46	5.46	27.44	5.58	27.41	5.70	28
29	28.47	5.53	28.44	5.66	28.42	5.78	28.39	5.91	29
30	29.45	5.72	29.42	5.85	29.40	5.98	29.37	6.11	30
31	30.43	5.92	30.40	6.05	30.38	6.18	30.35	6.31	31
32	31.41	6.11	31.39	6.24	31.36	6.38	31.33	6.52	32
33	32.39	6.30	32.37	6.44	32.34	6.58	32.31	6.72	33
34	33.38	6.49	33.35	6.63	33.32	6.78	33.29	6.92	34
35	34.36	6.68	34.33	6.83	34.30	6.98	34.27	7.13	35
36	35.34	6.87	35.31	7.02	35.28	7.18	35.25	7.33	36
37	36.32	7.06	36.29	7.22	36.26	7.38	36.22	7.53	37
38	37.30	7.25	37.27	7.41	37.24	7.58	37.20	7.74	38
39	38.28	7.44	38.25	7.61	38.22	7.78	38.18	7.94	39
40	39.27	7.63	39.23	7.80	39.20	7.97	39.16	8.15	40
41	40.25	7.82	40.21	8.00	40.18	8.17	40.14	8.35	41
42	41.23	8.01	41.19	8.19	41.16	8.37	41.12	8.55	42
43	42.21	8.20	42.17	8.39	42.14	8.57	42.10	8.76	43
44	43.19	8.40	43.15	8.58	43.12	8.77	43.08	8.96	44
45	44.17	8.59	44.14	8.78	44.10	8.97	44.06	9.16	45
46	45.15	8.78	45.12	8.97	45.08	9.17	45.04	9.37	46
47	46.14	8.97	46.10	9.17	46.06	9.37	46.02	9.57	47
48	47.12	9.16	47.08	9.36	47.04	9.57	47.99	9.78	48
49	48.10	9.35	48.06	9.56	48.02	9.77	48.97	9.98	49
50	49.08	9.54	49.04	9.75	49.00	9.97	49.95	10.18	50
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat.	Dist.
	79 Deg.		78¾ Deg		78½ Deg		78¼ Deg.		

Dist.	11 Deg. Lat.	11 Deg. Dep.	11¼ Deg. Lat.	11¼ Deg. Dep.	11½ Deg. Lat.	11½ Deg. Dep.	11¾ Deg. Lat	11¾ Deg. Dep.	Dist.
51	50.06	9.73	50.02	9.95	49.98	10.17	49.93	10.39	51
52	51.04	9.92	51.00	10.14	50.96	10.37	50.91	10.59	52
53	52.03	10.11	51.98	10.34	51.94	10.57	51.89	10.79	53
54	53.01	10.30	52.96	10.53	52.92	10.77	52.87	11.00	54
55	53.99	10.49	53.94	10.73	53.90	10.97	53.85	11.20	55
56	54.97	10.69	54.92	10.93	54.88	11.16	54.83	11.40	56
57	55.95	10.88	55.90	11.12	55.86	11.36	55.81	11.61	57
58	56.93	11.07	56.89	11.32	56.84	11.56	56.78	11.81	58
59	57.92	11.26	57.87	11.51	57.82	11.76	57.76	12.01	59
60	58.90	11.45	58.85	11.71	58.80	11.96	58.74	12.22	60
61	59.88	11.64	59.83	11.90	59.78	12.16	59.72	12.42	61
62	60.86	11.83	60.81	12.10	60.76	12.36	60.70	12.63	62
63	61.84	12.02	61.79	12.29	61.74	12.56	61.68	12.83	63
64	62.82	12.21	62.77	12.49	62.72	12.76	62.66	13.03	64
65	63.81	12.40	63.75	12.68	63.70	12.96	63.64	13.24	65
66	64.79	12.59	64.73	12.88	64.68	15.16	64.62	13.44	66
67	65.77	12.78	65.71	13.07	65.66	13.36	65.60	13.64	67
68	66.75	12.98	66.69	13.27	66.63	13.56	66.58	13.85	68
69	67.73	13.17	67.67	13.46	67.61	13.76	67.55	14.05	69
70	68.71	13.36	68.66	13.66	68.59	13.96	68.53	14.25	70
71	69.70	13.55	69.64	13.85	69.57	14.16	69.51	14.46	71
72	70.68	13.74	70.62	14.05	70.55	14.35	70.49	14.66	72
73	71.66	13.93	71.60	14.24	71.53	14.55	71.47	14.87	73
74	72.64	14.12	72.58	14.44	72.51	14.75	72.45	15.07	74
75	73.62	14.31	73.56	14.63	73.49	14.95	73.43	15.27	75
76	74.60	14.50	74.54	14.83	74.47	15.15	74.41	15.48	76
77	75.59	14.69	75.52	15.02	75.45	15.35	75.39	15.68	77
78	76.57	14.88	76.50	15.22	76.43	15.55	76.37	15.88	78
79	77.55	15.07	77.48	15.41	77.41	15.75	77.34	16.09	79
80	78.53	15.26	78.46	15.61	78.39	15.95	78.32	16.29	80
81	79.51	15.46	79.44	15.80	79.37	16 15	79.30	16.49	81
82	80.49	15.65	80.42	16.00	80.35	16.35	80.28	16.70	82
83	81.48	15.84	81.41	16.19	81.33	16.55	81.26	16.90	83
84	82.46	16.03	82.39	16.39	82.31	16.75	82.24	17.11	84
85	83.44	16.22	83.37	16.58	83.29	16.95	83.22	17.31	85
86	84.42	16.41	84.35	16.78	84.27	17.15	84.20	17.51	86
87	85.40	16.60	85.33	16.97	85.25	17.35	85.18	17.72	87
88	86.38	16.79	86.31	17.17	86.23	17.54	86.16	17.92	88
89	87.36	16.98	87.29	17.36	87.21	17.74	87.14	18.12	89
90	88.35	17.17	88.27	17.56	88.19	17.94	88.11	18.33	90
91	89.33	17.36	89.25	17.75	89.17	18.14	89.09	18.53	91
92	90.31	17.55	90.23	17.95	90.15	18.34	90.07	18.74	92
93	91.29	17.75	91.21	18.14	91.13	18.54	91.05	18.94	93
94	92.27	17.94	92.19	18.34	92.11	18.74	92.03	19.14	94
95	93.25	18.13	93.17	18.53	93.09	18.94	93.01	19.35	95
96	94.24	18.32	94.16	18.73	94.07	19.14	93.99	19.55	96
97	95.22	18.51	95.14	18.92	95.05	19.34	94.97	19.75	97
98	96.20	18.70	96.12	19.12	96.04	19.54	95.95	19.96	98
99	97.18	18.89	97.10	19.31	97.01	19.74	96.93	20.16	99
100	98.16	19.08	98.08	19.51	98.99	19.94	97.90	20.36	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	79 Deg.		78¾ Deg.		78½ Deg.		78¼ Deg.		

Dist	12 Deg.		12¼ Deg.		12½ Deg.		12¾ Deg.		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.98	0.21	0.98	0.21	0.98	0.22	0.98	0.22	1
2	1.96	0.42	1.95	0.42	1.95	0.43	1.95	0.44	2
3	2.93	0.62	2.93	0.64	2.93	0.65	2.93	0.66	3
4	3.91	0.83	3.91	0.85	3.91	0.87	3.90	0.88	4
5	4.89	1.04	4.89	1.06	4.88	1.08	4.88	1.10	5
6	5.87	1.25	5.86	1.27	5.86	1.30	5.85	1.32	6
7	6.85	1.46	6.84	1.49	6.83	1.52	6.83	1.54	7
8	7.83	1.66	7.82	1.70	7·81	1.73	7.80	1.77	8
9	8.80	1.87	8.80	1.91	8.79	1.95	8.78	1.99	9
10	9.78	2.08	9.77	2.12	9.76	2.16	9.75	2.21	10
11	10.76	2.29	10.75	2.33	10.74	2.38	10.73	2.43	11
12	11.74	2.49	11.73	2.55	11.72	2.60	11.70	2.65	12
13	12.72	2.70	12.70	2.76	12.69	2.81	12.68	2.87	13
14	13.69	2.91	13.68	2.97	13.67	3.03	13.65	3.09	14
15	14.67	3.12	14.66	3.18	14.64	3.25	14.63	3.31	15
16	15.65	3.33	15.64	3.39	15.62	3.46	15.61	3.53	16
17	16.63	3.53	16.61	3.61	16.60	3.68	16.58	3.75	17
18	17.61	3.74	17.59	3.82	17·57	3.90	17.56	3.97	18
19	18.58	3.95	18.57	4.03	18.55	4.11	18.53	4.19	19
20	19.56	4.16	19.54	4.24	19.53	4.33	19.51	4.41	20
21	20.54	4.37	20.52	4.46	20.50	4.55	20.48	4.63	21
22	21.52	4.57	21.50	4.67	21.48	4.76	21.46	4.86	22
23	22.50	4.78	22.48	4.88	22.45	4.98	22.43	5.08	23
24	23.48	4.99	23.45	5.09	23.43	5.19	23.41	5.30	24
25	24.45	5.20	24.43	5.30	24.41	5.41	24.38	5.52	25
26	25.43	5.41	25.41	5.52	25.38	5.63	25.36	5.74	26
27	26.41	5.61	26.39	5.73	26.36	5.84	26.33	5.96	27
28	27.39	5.82	27.36	5.94	27.34	6.06	27.31	6.18	28
29	28.37	6.03	28.34	6.15	28.31	6.28	28.28	6·40	29
30	29.34	6.24	29.32	6.37	29·29	6.49	29.26	6.62	30
31	30.32	6.45	30.29	6.58	30.27	6.71	30.24	6.84	31
32	31.30	6.65	31.27	6·79	31.24	6.93	31.21	7.06	32
33	32.28	6.86	32.25	7.00	32.22	7.14	32.19	7.28	33
34	33.26	7.07	33.23	7.21	33.19	7.36	33.16	7.50	34
35	34.24	7.28	34.20	7.43	34.17	7.58	34.14	7.72	35
36	35.21	7.48	35.18	7.64	35.15	7.79	35.11	7.95	36
37	36.19	7.69	36.16	7.85	36.12	8.01	36.09	8.17	37
38	37.17	7.90	37.13	8.06	37·10	8.22	37.06	8.39	38
39	38.15	8.11	38.11	8.27	38.08	8.44	38.04	8.61	39
40	39.13	8·32	39.09	8.49	39.05	8·66	39.01	8.83	40
41	40.10	8.52	40.07	8.70	40.03	8.87	39.99	9.05	41
42	41.08	8.73	41.04	8.91	41.00	9.09	40.96	9.27	42
43	42.06	8.94	42.02	9.12	41.98	9.31	41.94	9.49	43
44	43.04	9.15	43.00	9.34	42.96	9.52	42.92	9.71	44
45	44.02	9.36	43.98	9.55	43.93	9.74	43.89	9.93	45
46	44.99	9.56	44.95	9.76	44.91	9.96	44.87	10.15	46
47	45.97	9.77	45.93	9.97	45.89	10.17	45.84	10.37	47
48	46.95	9.98	46.91	10.18	46.86	10.39	46.82	10.59	48
49	47.93	10.19	47.88	10.40	47.84	10.61	47.79	10.81	49
50	48.91	10.40	48.86	10·61	48.81	10.82	48.77	11.03	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	78 Deg.		77¾ Deg.		77½ Deg.		77¼ Deg.		

Dist.	12 Deg.		12¼ Deg.		12½ Deg.		12¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49.89	10.60	49.84	10.82	49.79	11.04	49.74	11.26	51
52	50.86	10.81	50.82	11.03	50.77	11.25	50.72	11.48	52
53	51.84	11.02	51.79	11.25	51.74	11.47	51.69	11.70	53
54	52.82	11.23	52.77	11.46	52.72	11.69	52.67	11.92	54
55	53.80	11.44	53.75	11.67	53.70	11.90	53.64	12.14	55
56	54.78	11.64	54.72	11.88	54.67	12.12	54.62	12.36	56
57	55.75	11.85	55.70	12.09	55.65	12.34	55.59	12.58	57
58	56.73	12.06	56.68	12.31	56.63	12.55	56.57	12.80	58
59	57.71	12.27	57.66	12.52	57.60	12.77	57.55	13.02	59
60	58.69	12.47	58.63	12.73	58.58	12.99	58.52	13.24	60
61	59.67	12.68	59.61	12.94	59.55	13.20	59.50	13.46	61
62	60.65	12.89	60.59	13.16	60.53	13.42	60.47	13.68	62
63	61.62	13.10	61.57	13.37	61.51	13.64	61.45	13.90	63
64	62.60	13.31	62.54	13.58	62.48	13.85	62.42	14.12	64
65	63.58	13.51	63.52	13.79	63.46	14.07	63.40	14.35	65
66	64.56	13.72	64.50	14.00	64.44	14.29	64.37	14.57	66
67	65.54	13.93	65.47	14.22	65.41	14.50	65.35	14.79	67
68	66.51	14.14	66.45	14.43	66.39	14.72	66.32	15.01	68
69	67.49	14.35	67.43	14.64	67.36	14.93	67.30	15.23	69
70	68.47	14.55	68.41	14.85	68.34	15.15	68.27	15.45	70
71	69.45	14.76	69.38	15.06	69.32	15.37	69.25	15.67	71
72	70.43	14.97	70.36	15.28	70.29	15.58	70.22	15.89	72
73	71.40	15.18	71.34	15.49	71.27	15.80	71.20	16.11	73
74	72.38	15.39	72.32	15.70	72.25	16.02	72.18	16.33	74
75	73.36	15.59	73.29	15.91	73.22	16.23	73.15	16.55	75
76	74.34	15.80	74.27	16.13	74.20	16.45	74.13	16.77	76
77	75.32	16.01	75.25	16.34	75.17	16.67	75.10	16.99	77
78	76.30	16.22	76.22	16.55	76.15	16.88	76.08	17.21	78
79	77.27	16.43	77.20	16.76	77.13	17.10	77.05	17.44	79
80	78.25	16.63	78.18	16.97	78.10	17.32	78.03	17.66	80
81	79.23	16.84	79.16	17.19	79.08	17.53	79.00	17.88	81
82	80.21	17.05	80.13	17.40	80.06	17.75	79.98	18.10	82
83	81.19	17.26	81.11	17.61	81.03	17.96	80.95	18.32	83
84	82.16	17.46	82.09	17.82	82.01	18.18	81.93	18.54	84
85	83.14	17.67	83.06	18.04	82.99	18.40	82.90	18.76	85
86	84.12	17.88	84.04	18.25	83.96	18.61	83.88	18.98	86
87	85.10	18.09	85.02	18.46	84.94	18.83	84.85	19.20	87
88	86.08	18.30	86.00	18.67	85.91	19.05	85.83	19.42	88
89	87.06	18.50	86.97	18.88	86.89	19.26	86.81	19.64	89
90	88.03	18.71	87.95	19.10	87.87	19.48	87.78	19.86	90
91	89.01	18.92	88.93	19.31	88.84	19.70	88.76	20.08	91
92	89.99	19.13	89.91	19.52	89.82	19.91	89.73	20.30	92
93	90.97	19.34	90.88	19.73	90.80	20.13	90.71	20.52	93
94	91.95	19.54	91.86	19.94	91.77	20.35	91.68	20.75	94
95	92.92	19.75	92.84	20.16	92.75	20.56	92.66	20.97	95
96	93.90	19.96	93.81	20.37	93.72	20.78	93.63	21.19	96
97	94.88	20.17	94.79	20.58	94.70	20.99	94.61	21.41	97
98	95.86	20.38	95.77	20.79	95.68	21.21	95.58	21.63	98
99	96.84	20.58	96.75	21.01	96.65	21.43	96.56	21.85	99
100	97.81	20.79	97.72	21.22	97.63	21.64	97.53	22.07	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	78 Deg.		77¾ Deg.		77½ Deg.		77¼ Deg.		

1 D

Dist.	13 Deg. Lat.	Dep.	13¼ Deg. Lat.	Dep.	13½ Deg. Lat.	Dep.	13¾ Deg. Lat.	Dep.	Dist.
1	0.97	0.23	0.97	0.23	0.97	0.23	0.97	0.24	1
2	1.95	0.45	1.95	0.46	1.95	0.47	1.94	0.48	2
3	2.92	0.67	2.92	0.69	2.92	0.70	2.91	0.71	3
4	3.90	0.90	3.89	0.92	3.89	0.93	3.89	0.95	4
5	4.87	1.12	4.87	1.15	4.86	1.17	4.86	1.19	5
6	5.85	1.35	5.84	1.38	5.83	1.40	5.83	1.43	6
7	6.82	1.57	6.81	1.60	6.81	1.63	6.80	1.66	7
8	7.80	1.80	7.79	1.83	7.78	1.87	7.77	1.90	8
9	8.77	2.02	8.76	2.06	8.75	2.10	8.74	2.14	9
10	9.74	2.25	9.73	2.29	9.72	2.33	9.71	2.38	10
11	10.72	2.47	10.71	2.52	10.70	2.57	10.68	2.61	11
12	11.69	2.70	11.68	2.75	11.67	2.80	11.66	2.85	12
13	12.67	2.92	12.65	2.98	12.64	3.03	12.63	3.09	13
14	13.64	3.15	13.63	3.21	13.61	3.27	13.60	3.33	14
15	14.62	3.37	14.60	3.44	14.59	3.50	14.57	3.57	15
16	15.59	3.60	15.57	3.67	15.56	3.74	15.54	3.80	16
17	16.56	3.82	16.55	3.90	16.53	3.97	16.51	4.04	17
18	17.54	4.05	17.52	4.13	17.50	4.20	17.48	4.28	18
19	18.51	4.27	18.49	4.35	18.48	4.44	18.46	4.52	19
20	19.49	4.50	19.47	4.58	19.45	4.67	19.43	4.75	20
21	20.46	4.72	20.44	4.81	20.42	4.90	20.40	4.99	21
22	21.44	4.95	21.41	5.04	21.39	5.14	21.37	5.23	22
23	22.41	5.17	22.39	5.27	22.36	5.37	22.34	5.47	23
24	23.38	5.40	23.36	5.50	23.34	5.60	23.31	5.70	24
25	24.36	5.62	24.33	5.73	24.31	5.84	24.28	5.94	25
26	25.33	5.85	25.31	5.96	25.28	6.07	25.25	6.18	26
27	26.31	6.07	26.28	6.19	26.25	6.30	26.23	6.42	27
28	27.28	6.30	27.25	6.42	27.23	6.54	27.20	6.66	28
29	28.26	6.52	28.23	6.65	28.20	6.77	28.17	6.89	29
30	29.23	6.75	29.20	6.88	29·17	7.00	29.14	7.13	30
31	30.21	6.97	30.17	7.11	30.14	7.24	30.11	7.37	31
32	31.18	7.20	31.15	7.33	31.12	7.47	31.08	7.61	32
33	32.15	7.42	32.12	7.56	32.09	7.70	32.05	7.84	33
34	33.13	7.65	33.09	7.79	33.06	7.94	33.03	8.08	34
35	34.10	7.87	34.07	8.02	34.03	8.17	34.00	8.32	35
36	35.08	8.10	35.04	8.25	35.01	8.40	34.97	8.56	36
37	36.05	8.32	36.02	8.48	35.98	8.64	35.94	8.79	37
38	37.03	8.55	36.99	8.71	36.95	8.87	36.91	9.03	38
39	38.00	8.77	37.96	8.94	37.92	9.10	37.88	9.27	39
40	38.97	9.00	38.94	9.17	38.89	9.34	38.85	9.51	40
41	39.95	9.22	39.91	9.40	39.87	9.57	39.83	9.75	41
42	40.92	9.45	40.88	9.63	40.84	9.80	40.80	9.98	42
43	41.90	9.67	41.86	9.86	41.81	10.04	41.77	10.22	43
44	42.87	9.90	42.83	10.08	42.78	10.27	42.74	10.46	44
45	43.85	10.12	43.80	10.31	43.76	10.51	43.71	10.70	45
46	44.82	10.35	44.78	10.54	44.73	10.74	44.68	10.93	46
47	45.80	10.57	45.75	10.77	45.70	10.97	45.65	11.17	47
48	46.77	10.80	46.73	11.00	46.67	11.21	46.62	11.41	48
49	47.74	11.02	47.70	11.23	47.65	11.44	47.60	11.65	49
50	48.72	11.25	48.67	11.46	48.62	11·67	48.57	11.88	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	77 Deg.		76¾ Deg.		76½ Deg.		76¼ Deg.		

Dist.	13 Deg. Lat.	Dep.	13¼ Deg. Lat.	Dep.	13½ Deg. Lat.	Dep	13¾ Deg. Lat.	Dep.	Dist.
51	49.69	11.47	49.64	11.69	49.59	11.91	49.54	12.12	51
52	50.67	11.70	50.62	11.92	50.56	12.14	50.51	12.36	52
53	51.64	11.92	51.59	12.15	51.54	12.37	51.48	12.60	53
54	52.62	12.15	52.56	12.38	52.51	12.61	52.45	12.84	54
55	53.59	12.37	53.54	12.61	53.48	12.84	53.42	13.07	55
56	54.56	12.60	54.51	12.84	54.45	13.07	54.40	13.31	56
57	55.54	12.82	55.48	13.06	55.43	13.31	55.37	13.55	57
58	56.51	13.05	56.46	13.29	56.40	13.54	56.34	13.79	58
59	57.49	13.27	57.43	13.52	57.37	13.77	57.31	14.02	59
60	58.47	13.50	58.40	13.75	58.34	14.01	58.28	14.26	60
61	59.44	13.72	59.38	13.98	59.31	14.24	59.25	14.50	61
62	60.41	13.95	60.35	14.21	60.29	14.47	60.22	14.74	62
63	61.39	14.17	61.32	14.44	61.26	14.71	61.19	14.97	63
64	62.36	14.40	62.30	14.67	62.23	14.94	62.17	15.21	64
65	63.33	14.62	63.27	14.90	63.20	15.17	63.14	15.45	65
66	64.31	14.85	64.24	15.13	64.18	15.41	64.11	15.69	66
67	65.28	15.07	65.22	15.36	65.15	15.64	65.08	15.93	67
68	66.26	15.30	66.19	15.59	66.12	15.87	66.05	16.16	68
69	67.23	15.52	67.16	15.81	67.09	16.11	67.02	16.40	69
70	68.21	15.75	68.14	16.04	68.07	16.34	67.99	16.64	70
71	69.18	15.97	69.11	16.27	69.04	16.57	68.97	16.88	71
72	70.15	16.20	70.08	16.50	70.01	16.81	69.94	17.11	72
73	71.13	16.42	71.06	16.73	70.98	17.04	70.91	17.35	73
74	72.10	16.65	72.03	16.96	71.96	17.28	71.88	17.59	74
75	73.08	16.87	73.00	17.19	72.93	17.50	72.85	17.83	75
76	74.05	17.10	73.98	17.42	73.90	17.74	73.82	18.06	76
77	75.03	17.32	74.95	17.65	74.87	17.98	74.79	18.30	77
78	76.00	17.55	75.92	17.88	75.84	18.21	75.76	18.54	78
79	76.98	17.77	76.90	18.11	76.82	18.44	76.74	18.78	79
80	77.95	18.00	77.87	18.34	77.79	18.68	77.71	19.01	80
81	78.92	18.22	78.84	18.57	78.76	18.91	78.68	19.25	81
82	79.90	18.45	79.82	18.79	79.73	19.14	79.65	19.49	82
83	80.87	18.67	80.79	19.02	80.71	19.38	80.62	19.73	83
84	81.85	18.90	81.76	19.25	81.68	19.61	81.59	19.97	84
85	82.82	19.12	82.74	19.48	82.65	19.84	82.56	20.20	85
86	83.80	19.35	83.71	19.71	83.62	20.08	83.54	20.44	86
87	84.77	19.57	84.68	19.94	84.60	20.31	84.51	20.68	87
88	85.74	19.80	85.66	20.17	85.57	20.54	85.48	20.92	88
89	86.72	20.02	86.63	20.40	86.54	20.78	86.45	21.15	89
90	87.69	20.25	87.60	20.63	87.51	21.01	87.42	21.39	90
91	88.67	20.47	88.58	20.86	88.49	21.24	88.39	21.63	91
92	89.64	20.70	89.55	21.09	89.46	21.48	89.36	21.87	92
93	90.62	20.92	90.52	21.32	90.43	21.71	90.33	22.10	93
94	91.59	21.15	91.50	21.54	91.40	21.94	91.31	22.34	94
95	92.57	21.37	92.47	21.77	92.38	22.18	92.28	22.58	95
96	93.54	21.60	93.44	22.00	93.35	22.41	93.25	22.82	96
97	94.51	21.82	94.42	22.23	94.32	22.64	94.22	23.06	97
98	95.49	22.05	95.39	22.46	95.29	22.88	95.19	23.29	98
99	96.46	22.27	96.36	22.69	96.26	23.11	96.16	23.53	99
100	97.44	22.50	97.34	22.92	97.24	23.34	97.13	23.77	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	77 Deg.		66¾ Deg.		76½ Deg.		76¼ Deg.		

Dist.	14 Deg.		14¼ Deg.		14½ Deg.		14¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.97	0.24	0.97	0.25	0.97	0.25	0.97	0.25	1
2	1.94	0.48	1.94	0.49	1.94	0.50	1.93	0.51	2
3	2.91	0.73	2.91	0.74	2.90	0.75	2.90	0.76	3
4	3.88	0.97	3.88	0.98	3.87	1.00	3.87	1.02	4
5	4.85	1.21	4.85	1.23	4.84	1.25	4.84	1.27	5
6	5.82	1.45	5.82	1.48	5.81	1.50	5.80	1.53	6
7	6.79	1.69	6.78	1.72	6.78	1.75	6.77	1.78	7
8	7.76	1.94	7.75	1.97	7.75	2.00	7.74	2.04	8
9	8.73	2.18	8.72	2.22	8.71	2.25	8.70	2.29	9
10	9.70	2.42	9.69	2.46	9.68	2.50	9.67	2.55	10
11	10.67	2.66	10.66	2.71	10.65	2.75	10.64	2.80	11
12	11.64	2.90	11.63	2.95	11.62	3.00	11.60	3.06	12
13	12.61	3.15	12.60	3.20	12.59	3.25	12.57	3.31	13
14	13.58	3.59	13.57	3.45	13.55	3.51	13.54	3.56	14
15	14.55	3.63	14.54	3.69	14.52	3.76	14.51	3.82	15
16	15.52	3.87	15.51	3.94	15.49	4.01	15.47	4.07	16
17	16.50	4.11	16.48	4.18	16.46	4.26	16.44	4.33	17
18	17.47	4.35	17.45	4.43	17.43	4.51	17.41	4.58	18
19	18.44	4.60	18.42	4.68	18.39	4.76	18.37	4.84	19
20	19.41	4.84	19.38	4.92	19.36	5.01	19.34	5.09	20
21	20.38	5.08	20.35	5.17	20.33	5.26	20.31	5.35	21
22	21.35	5.32	21.32	5.42	21.30	5.51	21.28	5.60	22
23	22.32	5.56	22.29	5.66	22.27	5.76	22.24	5.86	23
24	23.29	5.81	23.26	5.91	23.24	6.01	23.21	6.11	24
25	24.26	6.05	24.23	6.15	24.20	6.26	24.18	6.37	25
26	25.23	6.29	25.20	6.40	25.17	6.51	25.14	6.62	26
27	26.20	6.53	26.17	6.65	26.14	6.76	26.11	6.87	27
28	27.17	6.77	27.14	6.89	27.11	7.01	27.08	7.13	28
29	28.14	7.02	28.11	7.14	28.08	7.26	28.04	7.38	29
30	29.11	7.26	29.08	7.38	29.04	7.51	29.01	7.64	30
31	30.08	7.50	30.05	7.63	30.01	7.76	29.98	7.89	31
32	31.05	7.74	31.02	7.88	30.98	8.01	30.95	8.15	32
33	32.02	7.98	31.98	8.12	31.95	8.26	31.91	8.40	33
34	32.99	8.23	32.95	8.37	32.92	8.51	32.88	8.66	34
35	33.96	8.47	33.92	8.62	33.89	8.76	33.85	8.91	35
36	34.93	8.71	34.89	8.86	34.85	9.01	34.81	9.17	36
37	35.90	8.95	35.86	9.11	35.82	9.26	35.78	9.42	37
38	36.87	9.19	36.83	9.35	36.79	9.51	36.75	9.67	38
39	37.84	9.44	37.80	9.60	37.76	9.76	37.71	9.93	39
40	38.81	9.68	38.77	9.85	38.73	10.02	38.68	10.18	40
41	39.78	9.92	39.74	10.09	39.69	10.27	39.65	10.44	41
42	40.75	10.16	40.71	10.34	40.66	10.52	40.62	10.69	42
43	41.72	10.40	41.68	10.58	41.63	10.77	41.58	10.95	43
44	42.69	10.64	42.65	10.83	42.60	11.02	42.55	11.20	44
45	43.66	10.89	43.62	11.08	43.57	11.27	43.52	11.46	45
46	44.63	11.13	44.58	11.32	44.53	11.52	44.48	11.71	46
47	45.60	11.37	45.55	11.57	45.50	11.77	45.45	11.97	47
48	46.57	11.61	46.52	11.82	46.47	12.02	46.42	12.22	48
49	47.54	11.85	47.49	12.06	47.44	12.27	47.39	12.48	49
50	48.51	12.10	48.46	12.31	48.41	12.52	48.35	12.73	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	76 Deg.		75¾ Deg.		75½ Deg.		75¼ Deg.		

Dist.	16 Deg. Lat.	Dep.	16¼ Deg. Lat.	Dep.	16½ Deg. Lat.	Dep.	16¾ Deg. Lat.	Dep.	Dist.
51	49.02	14.06	48.96	14.27	48.90	14.48	48.84	14.70	51
52	49.99	14.33	49.92	14.55	49.86	14.77	49.79	14.99	52
53	50.95	14.61	50.88	14.83	50.82	15.05	50.75	15.27	53
54	51.91	14.88	51.84	15.11	51.78	15.34	51.71	15.56	54
55	52.87	15.16	52.80	15.39	52.74	15.62	52.67	15.85	55
56	53.83	15.44	53.76	15.67	53.69	15.90	53.62	16.14	56
57	54.79	15.71	54.72	15.95	54.65	16.19	54.58	16.43	57
58	55.75	15.99	55.68	16.23	55.61	16.47	55.54	16.72	58
59	56.71	16.26	56.64	16.51	56.57	16.76	56.50	17.00	59
60	57.68	16.54	57.60	16.79	57.53	17.04	57.45	17.29	60
61	58.64	16.81	58.56	17.07	58.49	17.32	58.41	17.58	61
62	59.60	17.09	59.52	17.35	59.45	17.61	59.37	17.87	62
63	60.56	17.37	60.48	17.63	60.41	17.89	60.33	18.16	63
64	61.52	17.64	61.44	17.91	61.36	18.18	61.28	18.44	64
65	62.48	17.92	62.40	18.19	62.32	18.46	62.24	18.73	65
66	63.44	18.19	63.36	18.47	63.28	18.74	63.20	19.02	66
67	64.40	18.47	64.32	18.75	64.24	19.03	64.16	19.31	67
68	65.37	18.74	65.28	19.03	65.20	19.31	65.11	19.60	68
69	66.33	19.02	66.24	19.31	66.16	19.60	66.07	19.89	69
70	67.29	19.29	67.20	19.59	67.11	19.88	67.03	20.17	70
71	68.25	19.57	68.16	19.87	68.08	20.17	67.99	20.46	71
72	69.21	19.85	69.12	20.15	69.03	20.45	68.95	20.75	72
73	70.17	20.12	70.08	20.43	69.99	20.73	69.90	21.04	73
74	71.13	20.40	71.04	20.71	70.95	21.02	70.86	21.33	74
75	72.09	20.67	72.00	20.99	71.91	21.30	71.82	21.61	75
76	73.06	20.95	72.96	21.27	72.87	21.59	72.78	21.90	76
77	74.02	21.22	73.92	21.55	73.83	21.87	73.73	22.19	77
78	74.98	21.50	74.88	21.83	74.79	22.15	74.69	22.48	78
79	75.94	21.78	75.84	22.11	75.75	22.44	75.65	22.77	79
80	76.90	22.05	76.80	22.39	76.71	22.72	76.61	23.06	80
81	77.86	22.33	77.76	22.67	77.66	23.01	77.56	23.34	81
82	78.82	22.60	78.72	22.95	78.62	23.29	78.52	23.63	82
83	79.78	22.88	79.68	23.23	79.58	23.57	79.48	23.91	83
84	80.75	23.15	80.64	23.51	80.54	23.86	80.44	24.21	84
85	81.71	23.43	81.60	23.79	81.50	24.14	81.39	24.50	85
86	82.67	23.70	82.56	24.07	82.46	24.43	82.35	24.78	86
87	83.63	23.98	83.52	24.35	83.42	24.71	83.31	25.07	87
88	84.59	24.26	84.48	24.62	84.38	24.99	84.27	25.36	88
89	85.55	24.53	85.44	24.90	85.33	25.28	85.22	25.65	89
90	86.51	24.81	86.40	25.18	86.29	25.56	86.18	25.94	90
91	87.47	25.08	87.36	25.46	87.25	25.85	87.14	26.23	91
92	88.44	25.36	88.32	25.74	88.21	26.13	88.10	26.51	92
93	89.40	25.63	89.28	26.02	89.17	26.41	89.05	26.80	93
94	90.36	25.91	90.24	26.30	90.13	26.70	90.01	27.09	94
95	91.32	26.19	91.20	26.58	91.09	26.98	90.97	27.38	95
96	92.28	26.46	92.16	26.86	92.05	27.27	91.93	27.67	96
97	93.24	26.74	93.12	27.14	93.01	27.55	92.88	27.95	97
98	94.20	27.01	94.08	27.42	93.96	27.83	93.84	28.24	98
99	95.16	27.29	95.04	27.70	94.92	28.12	94.80	28.53	99
100	96.13	27.56	96.00	27.98	95.88	28.40	95.76	28.82	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	74 Deg.		73¾ Deg.		73½ Deg.		73¼ Deg.		

Dist.	15 Deg. Lat.	Dep.	15¼ Deg. Lat.	Dep.	15½ Deg. Lat.	Dep.	15¾ Deg. Lat.	Dep.	Dist.
1	0.97	0.26	0.96	0.26	0.96	0.27	0.96	0.27	1
2	1.93	0.52	1.93	0.53	1.93	0.53	1.92	0.54	2
3	2.90	0.78	2.89	0.79	2.89	0.80	2.89	0.81	3
4	3.86	1.04	3.86	1.05	3.85	1.07	3.85	1.09	4
5	4.83	1.29	4.82	1.32	4.82	1.34	4.81	1.36	5
6	5.80	1.55	5.79	1.58	5.78	1.60	5.77	1.63	6
7	6.76	1.81	6.75	1.84	6.75	1.87	6.74	1.90	7
8	7.73	2.07	7.72	2.10	7.71	2.14	7.70	2.17	8
9	8.69	2.33	8.68	2.37	8.67	2.41	8.66	2.44	9
10	9.66	2.59	9.65	2.63	9.64	2.67	9.62	2.71	10
11	10.63	2.85	10.61	2.89	10.60	2.94	10.59	2.99	11
12	11.59	3.11	11.58	3.16	11.56	3.21	11.55	3.26	12
13	12.56	3.36	12.54	3.42	12.53	3.47	12.51	3.53	13
14	13.52	3.62	13.51	3.68	13.49	3.74	13.47	3.80	14
15	14.49	3.88	14.47	3.95	14.45	4.01	14.44	4.07	15
16	15.45	4.14	15.44	4.21	15.42	4.28	15.40	4.34	16
17	16.42	4.40	16.40	4.47	16.38	4.54	16.36	4.61	17
18	17.39	4.66	17.37	4.73	17.35	4.81	17.32	4.89	18
19	18.35	4.92	18.33	5.00	18.31	5.08	18.39	5.16	19
20	19.32	5.18	19.30	5.26	19.27	5.34	19.25	5.43	20
21	20.28	5.44	20.26	5.52	20.24	5.61	20.21	5.70	21
22	21.25	5.69	21.23	5.79	21.20	5.88	21.17	5.97	22
23	22.22	5.95	22.19	6.05	22.16	6.15	22.14	6.24	23
24	23.18	6.21	23.15	6.31	23.13	6.41	23.10	6.51	24
25	24.15	6.47	24.12	6.58	24.09	6.68	24.06	6.79	25
26	25.11	6.73	25.08	6.84	25.05	6.95	25.02	7.06	26
27	26.08	6.99	26.05	7.10	26.02	7.22	25.99	7.33	27
28	27.05	7.25	27.01	7.36	26.98	7.48	26.95	7.60	28
29	28.01	7.51	27.98	7.63	27.95	7.75	27.91	7.87	29
30	28.98	7.76	28.94	7.89	28.91	8.02	28.87	8.14	30
31	29.94	8.02	29.91	8.15	29.87	8.28	29.84	8.41	31
32	30.91	8.28	30.87	8.42	30.84	8.55	30.80	8.69	32
33	31.88	8.54	31.84	8.68	31.80	8.82	31.76	8.96	33
34	32.84	8.80	32.80	8.94	32.76	9.09	32.72	9.23	34
35	33.81	9.06	33.77	9.21	33.73	9.35	33.69	9.50	35
36	34.77	9.32	34.73	9.47	34.69	9.62	34.65	9.77	36
37	35.74	9.58	35.70	9.73	35.65	9.89	35.61	10.04	37
38	36.71	9.84	36.66	10.00	36.62	10.16	36.57	10.31	38
39	37.67	10.09	37.63	10.26	37.58	10.42	37.54	10.59	39
40	38.64	10.35	38.59	10.52	38.55	10.69	38.50	10.86	40
41	39.60	10.61	39.56	10.78	39.51	10.96	39.46	11.13	41
42	40.57	10.87	40.52	11.05	40.47	11.22	40.42	11.40	42
43	41.53	11.13	41.49	11.31	41.44	11.49	41.39	11.67	43
44	42.50	11.39	42.45	11.57	42.40	11.76	42.35	11.94	44
45	43.47	11.65	43.42	11.84	43.36	12.03	43.31	12.21	45
46	44.43	11.91	44.38	12.10	44.33	12.29	44.27	12.49	46
47	45.40	12.16	45.35	12.36	45.29	12.56	45.24	12.76	47
48	46.36	12.42	46.31	12.63	46.25	12.83	46.20	13.03	48
49	47.33	12.68	47.27	12.89	47.22	13.09	47.16	13.30	49
50	48.30	12.94	48.24	13.15	48.18	13.36	48.12	13.57	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	75 Deg.		74¾ Deg.		74½ Deg.		74¼ Deg.		

Dist.	15 Deg. Lat.	Dep.	15¼ Deg. Lat.	Dep.	15½ Deg. Lat.	Dep.	15¾ Deg. Lat.	Dep.	Dist.
51	49.26	13.20	49.20	13.41	49.15	13.63	49.09	13.84	51
52	50.23	13.46	50.17	13.68	50.11	13.90	50.05	14.11	52
53	51.19	13.72	51.13	13.94	51.07	14.16	51.01	14.39	53
54	52.16	13.98	52.10	14.20	52.04	14.43	51.97	14.66	54
55	53.13	14.24	53.06	14.47	53.00	14.70	52.94	14.93	55
56	54.09	14.49	54.03	14.73	53.96	14.97	53.90	15.20	56
57	55.06	14.75	54.99	14.99	54.93	15.23	54.86	15.47	57
58	56.02	15.01	55.96	15.26	55.89	15.50	55.82	15.74	58
59	56.99	15.27	56.92	15.52	56.85	15.77	56.78	16.01	59
60	57.96	15.53	57.89	15.78	57.82	16.03	57.75	16.29	60
61	58.92	15.79	58.85	16.04	58.78	16.30	58.71	16.56	61
62	59.89	16.05	59.82	16.31	59.75	16.57	59.67	16.83	62
63	60.85	16.31	60.78	16.57	60.71	16.84	60.63	17.10	63
64	61.82	16.56	61.75	16.83	61.67	17.10	61.60	17.37	64
65	62.79	16.82	62.71	17.10	62.64	17.37	62.56	17.64	65
66	63.75	17.08	63.68	17.36	63.60	17.64	63.52	17.92	66
67	64.72	17.34	64.64	17.62	64.56	17.90	64.48	18.19	67
68	65.68	17.60	65.61	17.89	65.53	18.17	65.45	18.46	68
69	66.65	17.86	66.57	18.15	66.49	18.44	66.41	18.73	69
70	67.61	18.12	67.54	18.41	67.45	18.71	67.37	19.00	70
71	68.58	18.38	68.50	18.68	68.42	18.97	68.33	19.27	71
72	69.55	18.63	69.46	18.94	69.38	19.24	69.30	19.54	72
73	70.51	18.89	70.43	19.20	70.35	19.51	70.26	19.82	73
74	71.48	19.15	71.39	19.46	71.31	19.78	71.22	20.09	74
75	72.44	19.41	72.36	19.73	72.27	20.04	72.18	20.36	75
76	73.41	19.67	73.32	19.99	73.24	20.31	73.15	20.63	76
77	74.38	19.93	74.29	20.25	74.20	20.58	74.11	20.90	77
78	75.34	20.19	75.25	20.52	75.16	20.84	75.07	21.17	78
79	76.31	20.45	76.22	20.78	76.13	21.11	76.03	21.44	79
80	77.27	20.71	77.18	21.04	77.09	21.38	77.00	21.72	80
81	78.24	20.96	78.15	21.31	78.05	21.65	77.96	21.99	81
82	79.21	21.22	79.11	21.57	79.02	21.91	78.92	22.26	82
83	80.17	21.48	80.08	21.83	79.98	22.18	79.88	22.53	83
84	81.14	21.74	81.04	22.09	80.94	22.45	80.85	22.80	84
85	82.10	22.00	82.01	22.36	81.91	22.72	81.81	23.07	85
86	83.07	22.26	82.97	22.62	82.87	22.98	82.77	23.34	86
87	84.04	22.52	83.94	22.88	83.84	23.25	83.73	23.62	87
88	85.00	22.78	84.90	23.15	84.80	23.52	84.70	23.89	88
89	85.97	23.03	85.87	23.41	85.76	23.78	85.66	24.16	89
90	86.93	23.29	86.83	23.67	86.73	24.05	86.62	24.43	90
91	87.90	23.55	87.80	23.94	87.69	24.32	87.58	24.70	91
92	88.87	23.81	88.76	24.20	88.65	24.59	88.55	24.97	92
93	89.83	24.07	89.73	24.46	89.62	24.85	89.51	25.24	93
94	90.80	24.33	90.69	24.72	90.58	25.12	90.47	25.52	94
95	91.76	24.59	91.65	24.99	91.54	25.39	91.43	25.79	95
96	92.73	24.85	92.62	25.25	92.51	25.65	92.40	26.06	96
97	93.69	25.11	93.58	25.51	93.47	25.92	93.36	26.33	97
98	94.66	25.36	94.55	25.78	94.44	26.19	94.32	26.60	98
99	95.63	25.62	95.51	26.04	95.40	26.46	95.28	26.87	99
100	96.59	25.88	96.48	26.30	96.36	26.72	96.25	27.14	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	75 Deg.		74¾ Deg.		74½ Deg.		74¼ Deg.		

Dist.	16 Deg. Lat.	Dep.	16¼ Deg. Lat.	Dep.	16½ Deg. Lat.	Dep.	16¾ Deg. Lat.	Dep.	Dist.
1	0.96	0.28	0.96	0.28	0.96	0.28	0.96	0.29	1
2	1.92	0.55	1.92	0.56	1.92	0.57	1.92	0.58	2
3	2.88	0.83	2.88	0.84	2.88	0.85	2.87	0.86	3
4	3.85	1.10	3.84	1.12	3.84	1.14	3.83	1.15	4
5	4.81	1.38	4.80	1.40	4.79	1.42	4.79	1.44	5
6	5.77	1.65	5.76	1.68	5.75	1.70	5.75	1.73	6
7	6.73	1.93	6.72	1.96	6.71	1.99	6.70	2.02	7
8	7.69	2.21	7.68	2.24	7.67	2.27	7.66	2.31	8
9	8.65	2.48	8.64	2.52	8.63	2.56	8.62	2.59	9
10	9.61	2.76	9.60	2.80	9.59	2.84	9.58	2.88	10
11	10.57	3.03	10.56	3.08	10.55	3.12	10.53	3.17	11
12	11.54	3.31	11.52	3.36	11.51	3.41	11.49	3.46	12
13	12.50	3.58	12.48	3.64	12.46	3.69	12.45	3.75	13
14	13.46	3.86	13.44	3.92	13.42	3.98	13.41	4.03	14
15	14.42	4.13	14.40	4.20	14.38	4.26	14.36	4.32	15
16	15.38	4.41	15.36	4.48	15.34	4.54	15.32	4.61	16
17	16.34	4.69	16.32	4.76	16.30	4.83	16.28	4.90	17
18	17.30	4.96	17.28	5.04	17.26	5.11	17.24	5.19	18
19	18.26	5.24	18.24	5.32	18.22	5.40	18.19	5.48	19
20	19.23	5.51	19.20	5.60	19.18	5.68	19.15	5.76	20
21	20.19	5.79	20.16	5.88	20.14	5.96	20.11	6.05	21
22	21.15	6.06	21.12	6.16	21.09	6.25	21.07	6.34	22
23	22.11	6.34	22.08	6.44	22.05	6.53	22.02	6.63	23
24	23.07	6.62	23.04	6.72	23.01	6.82	22.98	6.92	24
25	24.03	6.89	24.00	7.00	23.97	7.10	23.94	7.20	25
26	24.99	7.17	24.96	7.28	24.93	7.38	24.90	7.49	26
27	25.95	7.44	25.92	7.56	25.89	7.67	25.85	7.78	27
28	26.92	7.72	26.88	7.84	26.85	7.95	26.81	8.07	28
29	27.88	7.99	27.84	8.12	27.81	8.24	27.77	8.36	29
30	28.84	8.27	28.80	8.39	28.76	8.52	28.73	8.65	30
31	29.80	8.54	29.76	8.67	29.72	8.80	29.68	8.93	31
32	30.76	8.82	30.72	8.95	30.68	9.09	30.64	9.22	32
33	31.72	9.10	31.68	9.23	31.64	9.37	31.60	9.51	33
34	32.68	9.37	32.64	9.51	32.60	9.66	32.56	9.80	34
35	33.64	9.65	33.60	9.79	33.56	9.94	33.52	10.09	35
36	34.61	9.92	34.56	10.07	34.52	10.22	34.47	10.38	36
37	35.57	10.20	35.52	10.35	35.48	10.51	35.43	10.66	37
38	36.53	10.47	36.48	10.63	36.44	10.79	36.39	10.95	38
39	37.49	10.75	37.44	10.91	37.39	11.08	37.35	11.24	39
40	38.45	11.03	38.40	11.19	38.35	11.36	38.30	11.53	40
41	39.41	11.30	39.36	11.47	39.31	11.64	39.26	11.82	41
42	40.37	11.58	40.32	11.75	40.27	11.93	40.22	12.10	42
43	41.33	11.85	41.28	12.03	41.23	12.21	41.18	12.39	43
44	42.30	12.13	42.24	12.31	42.19	12.50	42.13	12.68	44
45	43.26	12.40	43.20	12.59	43.15	12.78	43.09	12.97	45
46	44.22	12.68	44.16	12.87	44.11	13.06	44.05	13.26	46
47	45.18	12.96	45.12	13.15	45.06	13.35	45.01	13.55	47
48	46.14	13.23	46.08	13.43	46.02	13.63	45.96	13.83	48
49	47.10	13.51	47.04	13.71	46.98	13.92	46.92	14.12	49
50	48.06	13.78	48.00	13.99	47.94	14.20	47.88	14.41	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	74 Deg.		73¾ Deg.		73½ Deg.		73¼ Deg.		

Dist	16 Deg. Lat	16 Deg. Dep	16¼ Deg. Lat	16¼ Deg. Dep	16½ Deg. Lat	16½ Deg. Dep	16¾ Deg. Lat	16¾ Deg. Dep	Dist
51	49.02	14.06	48.96	14.27	48.90	14.48	48.84	14.70	51
52	49.99	14.33	49.92	14.55	49.86	14.77	49.79	14.99	52
53	50.95	14.61	50.88	14.83	50.82	15.05	50.75	15.27	53
54	51.91	14.88	51.84	15.11	51.78	15.34	51.71	15.56	54
55	52.87	15.16	52.80	15.39	52.74	15.62	52.67	15.85	55
56	53.83	15.44	53.76	15.67	53.69	15.90	53.62	16.14	56
57	54.79	15.71	54.72	15.95	54.65	16.19	54.58	16.43	57
58	55.75	15.99	55.68	16.23	55.61	16.47	55.54	16.72	58
59	56.71	16.26	56.64	16.51	56.57	16.76	56.50	17.00	59
60	57.68	16.54	57.60	16.79	57.53	17.04	57.45	17.29	60
61	58.64	16.81	58.56	17.07	58.49	17.32	58.41	17.58	61
62	59.60	17.09	59.52	17.35	59.45	17.61	59.37	17.87	62
63	60.56	17.37	60.48	17.63	60.41	17.89	60.33	18.16	63
64	61.52	17.64	61.44	17.91	61.36	18.18	61.28	18.44	64
65	62.48	17.92	62.40	18.19	62.32	18.46	62.24	18.73	65
66	63.44	18.19	63.36	18.47	63.28	18.74	63.20	19.02	66
67	64.40	18.47	64.32	18.75	64.24	19.03	64.16	19.31	67
68	65.37	18.74	65.28	19.03	65.20	19.31	65.11	19.60	68
69	66.33	19.02	66.24	19.31	66.16	19.60	66.07	19.89	69
70	67.29	19.29	67.20	19.59	67.11	19.88	67.03	20.17	70
71	68.25	19.57	68.16	19.87	68.08	20.17	67.99	20.46	71
72	69.21	19.85	69.12	20.15	69.03	20.45	68.95	20.75	72
73	70.17	20.12	70.08	20.43	69.99	20.73	69.90	21.04	73
74	71.13	20.40	71.04	20.71	70.95	21.02	70.86	21.33	74
75	72.09	20.67	72.00	20.99	71.91	21.30	71.82	21.61	75
76	73.06	20.95	72.96	21.27	72.87	21.59	72.78	21.90	76
77	74.02	21.22	73.92	21.55	73.83	21.87	73.73	22.19	77
78	74.98	21.50	74.88	21.83	74.79	22.15	74.69	22.48	78
79	75.94	21.78	75.84	22.11	75.75	22.44	75.65	22.77	79
80	76.90	22.05	76.80	22.39	76.71	22.72	76.61	23.06	80
81	77.86	22.33	77.76	22.67	77.66	23.01	77.56	23.34	81
82	78.82	22.60	78.72	22.95	78.62	23.29	78.52	23.63	82
83	79.78	22.88	79.68	23.23	79.58	23.57	79.48	23.92	83
84	80.75	23.15	80.64	23.51	80.54	23.86	80.44	24.21	84
85	81.71	23.43	81.60	23.79	81.50	24.14	81.39	24.50	85
86	82.67	23.70	82.56	24.07	82.46	24.43	82.35	24.78	86
87	83.63	23.98	83.52	24.35	83.42	24.71	83.31	25.07	87
88	84.59	24.26	84.48	24.62	84.38	24.99	84.27	25.36	88
89	85.55	24.53	85.44	24.90	85.33	25.28	85.22	25.65	89
90	86.51	24.81	86.40	25.18	86.29	25.56	86.18	25.94	90
91	87.47	25.08	87.36	25.46	87.25	25.85	87.14	26.23	91
92	88.44	25.36	88.32	25.74	88.21	26.13	88.10	26.51	92
93	89.40	25.63	89.28	26.02	89.17	26.41	89.05	26.80	93
94	90.36	25.91	90.24	26.30	90.13	26.70	90.01	27.09	94
95	91.32	26.19	91.20	26.58	91.09	26.98	90.97	27.38	95
96	92.28	26.46	92.16	26.86	92.05	27.27	91.93	27.67	96
97	93.24	26.74	93.12	27.14	93.01	27.55	92.88	27.95	97
98	94.20	27.01	94.08	27.42	93.96	27.83	93.84	28.24	98
99	95.16	27.29	95.04	27.70	94.92	28.12	94.80	28.53	99
100	96.13	27.56	96.00	27.98	95.88	28.40	95.76	28.82	100
Dist	Dep	Lat	Dep	Lat	Dep.	Lat	Dep	Lat	Dist
	74 Deg.		73¾ Deg.		73½ Deg.		73¼ Deg.		

1 E

Dist	17 Deg. Lat.	17 Deg. Dep.	17¼ Deg. Lat.	17¼ Deg. Dep.	17½ Deg. Lat.	17½ Deg. Dep.	17¾ Deg. Lat.	17¾ Deg. Dep.	Dist
1	0.96	0.29	0.95	0.30	0.95	0.30	0.95	0.30	1
2	1.91	0.58	1.91	0.59	1.91	0.60	1.90	0.61	2
3	2.87	0.88	2.87	0.89	2.86	0.90	2.86	0.91	3
4	3.83	1.17	3.82	1.19	3.81	1.20	3.81	1.22	4
5	4.78	1.46	4.78	1.48	4.77	1.50	4.76	1.52	5
6	5.74	1.75	5.73	1.78	5.72	1.80	5.71	1.83	6
7	6.69	2.05	6.69	2.08	6.68	2.10	6.67	2.13	7
8	7.65	2.34	7.64	2.37	7.63	2.41	7.62	2.44	8
9	8.61	2.63	8.60	2.67	8.58	2.71	8.57	2.74	9
10	9.56	2.92	9.55	2.97	9.54	3.01	9.52	3.05	10
11	10.52	3.22	10.51	3.26	10.49	3.31	10.48	3.35	11
12	11.48	3.51	11.46	3.56	11.44	3.61	11.43	3.66	12
13	12.43	3.80	12.42	3.85	12.40	3.91	12.38	3.96	13
14	13.39	4.09	13.37	4.15	13.35	4.21	13.33	4.27	14
15	14.34	4.39	14.33	4.45	14.31	4.51	14.29	4.57	15
16	15.30	4.68	15.28	4.74	15.26	4.81	15.24	4.88	16
17	16.26	4.97	16.24	5.04	16.21	5.11	16.19	5.18	17
18	17.21	5.26	17.19	5.34	17.17	5.41	17.14	5.49	18
19	18.17	5.56	18.15	5.63	18.12	5.71	18.10	5.79	19
20	19.13	5.85	19.10	5.93	19.07	6.01	19.05	6.10	20
21	20.08	6.14	20.06	6.23	20.03	6.31	20.00	6.40	21
22	21.04	6.43	21.01	6.52	20.98	6.62	20.95	6.71	22
23	21.99	6.72	21.97	6.82	21.94	6.92	21.91	7.01	23
24	22.95	7.02	22.92	7.12	22.89	7.22	22.86	7.32	24
25	23.91	7.31	23.88	7.41	23.84	7.52	23.81	7.62	25
26	24.86	7.60	24.83	7.71	24.80	7.82	24.76	7.93	26
27	25.82	7.89	25.79	8.01	25.75	8.12	25.71	8.23	27
28	26.78	8.19	26.74	8.30	26.70	8.42	26.67	8.54	28
29	27.73	8.48	27.70	8.60	27.66	8.72	27.62	8.84	29
30	28.69	8.77	28.65	8.90	28.61	9.02	28.57	9.15	30
31	29.65	9.06	29.61	9.19	29.57	9.32	29.52	9.45	31
32	30.60	9.36	30.56	9.49	30.52	9.62	30.48	9.76	32
33	31.56	9.65	31.52	9.79	31.47	9.92	31.43	10.06	33
34	32.51	9.94	32.47	10.08	32.43	10.22	32.38	10.37	34
35	33.47	10.23	33.43	10.38	33.38	10.52	33.33	10.67	35
36	34.43	10.53	34.38	10.68	34.33	10.83	34.29	10.98	36
37	35.38	10.82	35.34	10.97	35.29	11.13	35.24	11.28	37
38	36.34	11.11	36.29	11.27	36.24	11.43	36.19	11.58	38
39	37.30	11.40	37.25	11.57	37.20	11.73	37.14	11.89	39
40	38.25	11.69	38.20	11.86	38.15	12.03	38.10	12.19	40
41	39.21	11.99	39.16	12.16	39.10	12.33	39.05	12.50	41
42	40.16	12.28	40.11	12.45	40.06	12.63	40.00	12.80	42
43	41.12	12.57	41.07	12.75	41.01	12.93	40.95	13.11	43
44	42.08	12.86	42.02	13.05	41.96	13.23	41.91	13.41	44
45	43.03	13.16	42.98	13.34	42.92	13.53	42.86	13.72	45
46	43.99	13.45	43.93	13.64	43.87	13.83	43.81	14.02	46
47	44.95	13.74	44.89	13.94	44.82	14.13	44.76	14.38	47
48	45.90	14.03	45.84	14.23	45.78	14.43	45.72	14.63	48
49	46.86	14.33	46.80	14.53	46.73	14.73	46.67	14.94	49
50	47.82	14.62	47.75	14.83	47.69	15.04	47.62	15.24	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	73 Deg.		72¾ Deg.		72½ Deg.		72¼ Deg.		

Dist	17 Deg. Lat.	Dep.	17¼ Deg. Lat.	Dep.	17½ Deg. Lat.	Dep.	17¾ Deg. Lat.	Dep.	Dist
51	48.77	14.91	48.71	15.12	48.64	15.34	48.57	15.55	51
52	49.73	15.20	49.66	15.42	49.59	15.64	49.52	15.85	52
53	50.68	15.50	50.62	15.72	50.55	15.94	50.48	16.16	53
54	51.64	15.79	51.57	16.01	51.50	16.24	51.43	16.46	54
55	52.60	16.08	52.53	16.31	52.45	16.54	52.38	16.77	55
56	53.55	16.37	53.48	16.61	53.41	16.84	53.33	17.07	56
57	54.51	16.67	54.44	16.90	54.36	17.14	54.29	17.38	57
58	55.47	16.96	55.39	17.20	55.32	17.44	55.24	17.68	58
59	56.42	17.25	56.35	17.50	56.27	17.74	56.19	17.99	59
60	57.38	17.54	57.30	17.79	57.22	18.04	57.14	18.29	60
61	58.33	17.83	58.26	18.09	58.18	18.34	58.10	18.60	61
62	59.29	18.13	59.21	18.39	59.13	18.64	59.05	18.90	62
63	60.25	18.42	60.17	18.68	60.08	18.94	60.00	19.21	63
64	61.20	18.71	61.12	18.98	61.04	19.25	60.95	19.51	64
65	62.16	19.00	62.08	19.28	61.99	19.55	61.91	19.82	65
66	63.12	19.30	63.03	19.57	62.95	19.85	62.86	20.12	66
67	64.07	19.59	63.99	19.87	63.90	20.15	63.81	20.43	67
68	65.03	19.88	64.94	20.16	64.85	20.45	64.76	20.73	68
69	65.99	20.17	65.90	20.46	65.81	20.75	65.72	21.04	69
70	66.94	20.47	66.85	20.76	66.76	21.05	66.67	21.34	70
71	67.90	20.76	67.81	21.05	67.71	21.35	67.62	21.65	71
72	68.85	21.05	68.76	21.35	68.67	21.65	68.57	21.95	72
73	69.81	21.34	69.72	21.65	69.62	21.95	69.52	22.26	73
74	70.77	21.64	70.67	21.94	70.58	22.25	70.48	22.56	74
75	71.72	21.93	71.63	22.24	71.53	22.55	71.43	22.86	75
76	72.68	22.22	72.58	22.54	72.48	22.85	72.38	23.17	76
77	73.64	22.51	73.54	22.83	73.44	23.15	73.33	23.47	77
78	74.59	22.81	74.49	23.13	74.39	23.46	74.29	23.78	78
79	75.55	23.10	75.45	23.43	75.34	23.76	75.24	24.08	79
80	76.50	23.39	76.40	23.72	76.30	24.06	76.19	24.39	80
81	77.46	23.68	77.36	24.02	77.25	24.36	77.14	24.69	81
82	78.42	23.97	78.31	24.32	78.20	24.66	78.10	25.00	82
83	79.37	24.27	79.27	24.61	79.16	24.96	79.05	25.30	83
84	80.33	24.56	80.22	24.91	80.11	25.26	80.00	25.61	84
85	81.29	24.85	81.18	25.21	81.07	25.56	80.95	25.91	85
86	82.24	25.14	82.13	25.50	82.02	25.86	81.91	26.22	86
87	83.20	25.44	83.09	25.80	82.97	26.16	82.86	26.52	87
88	84.15	25.73	84.04	26.10	83.93	26.46	83.81	26.83	88
89	85.11	26.02	85.00	26.39	84.88	26.76	84.76	27.13	89
90	86.07	26.31	85.95	26.69	85.83	27.06	85.72	27.44	90
91	87.02	26.61	86.91	26.99	86.79	27.36	86.67	27.74	91
92	87.98	26.90	87.86	27.28	87.74	27.66	87.62	28.05	92
93	88.94	27.19	88.82	27.58	88.70	27.97	88.57	28.35	93
94	89.89	27.48	89.77	27.87	89.65	28.27	89.53	28.66	94
95	90.85	27.78	90.73	28.17	90.60	28.57	90.48	28.96	95
96	91.81	28.07	91.68	28.47	91.56	28.87	91.43	29.27	96
97	92.76	28.36	92.64	28.76	92.51	29.17	92.38	29.57	97
98	93.72	28.65	93.59	29.06	93.46	29.47	93.33	29.88	98
99	94.67	28.94	94.55	29.36	94.42	29.77	94.29	30.18	99
100	95.63	29.24	95.50	29.65	95.37	30.07	95.24	30.49	100
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	73 Deg.		72¾ Deg.		72½ Deg.		72¼ Deg.		

Dist	18 Deg.		18¼ Deg.		18½ Deg.		18¾ Deg.		Dist
	Lar.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.95	0.31	0.95	0.31	0.95	0.32	0.95	0.32	1
2	1.90	0.62	1.90	0.63	1.90	0.63	1.89	0.64	2
3	2.85	0.93	2.85	0.94	2.84	0.95	2.84	0.96	3
4	3.80	1.24	3.80	1.25	3.79	1.27	3.79	1.29	4
5	4.76	1.55	4.75	1.57	4.74	1.59	4.73	1.61	5
6	5.71	1.85	5.70	1.88	5.69	1.90	5.68	1.93	6
7	6.66	2.16	6.65	2.19	6.64	2.22	6.63	2.25	7
8	7.61	2.47	7.60	2.51	7.59	2.54	7.58	2.57	8
9	8.56	2.78	8.55	2.82	8.53	2.86	8.52	2.89	9
10	9.51	3.09	9.50	3.13	9.48	3.17	9.47	3.21	10
11	10.46	3.40	10.45	3.44	10.43	3.49	10.42	3.54	11
12	11.41	3.71	11.40	3.76	11.38	3.81	11.36	3.85	12
13	12.36	4.02	12.35	4.07	12.33	4.12	12.31	4.18	13
14	13.31	4.33	13.30	4.38	13.28	4.44	13.26	4.50	14
15	14.27	4.64	14.25	4.70	14.22	4.76	14.20	4.82	15
16	15.22	4.94	15.20	5.01	15.17	5.08	15.15	5.14	16
17	16.17	5.25	16.14	5.32	16.12	5.39	16.10	5.46	17
18	17.12	5.56	17.09	5.64	17.07	5.71	17.04	5.79	18
19	18.07	5.87	18.04	5.95	18.02	6.03	17.99	6.11	19
20	19.02	6.18	18.99	6.26	18.97	6.35	18.94	6.43	20
21	19.97	6.49	19.94	6.58	19.91	6.66	19.89	6.75	21
22	20.92	6.80	20.89	6.89	20.86	6.98	20.83	7.07	22
23	21.87	7.11	21.84	7.20	21.81	7.30	21.78	7.39	23
24	22.83	7.42	22.79	7.52	22.76	7.62	22.73	7.71	24
25	23.78	7.73	23.74	7.83	23.71	7.93	23.67	8.04	25
26	24.73	8.03	24.69	8.14	24.66	8.25	24.62	8.36	26
27	25.68	8.34	25.64	8.46	25.60	8.57	25.57	8.68	27
28	26.63	8.65	26.59	8.77	26.55	8.88	26.51	9.00	28
29	27.58	8.96	27.54	9.08	27.50	9.20	27.46	9.32	29
30	28.53	9.27	28.49	9.39	28.45	9.52	28.41	9.64	30
31	29.48	9.58	29.44	9.71	29.40	9.84	29.35	9.96	31
32	30.43	9.89	30.39	10.02	30.35	10.15	30.30	10.29	32
33	31.38	10.20	31.34	10.33	31.29	10.47	31.25	10.61	33
34	32.34	10.51	32.29	10.65	32.24	10.79	32.20	10.93	34
35	33.29	10.82	33.24	10.96	33.19	11.11	33.14	11.25	35
36	34.24	11.12	34.19	11.27	34.14	11.42	34.09	11.57	36
37	35.19	11.43	35.14	11.59	35.09	11.74	35.04	11.89	37
38	36.14	11.74	36.09	11.90	36.04	12.06	35.98	12.21	38
39	37.09	12.05	37.04	12.21	36.98	12.37	36.93	12.54	39
40	38.04	12.36	37.99	12.53	37.93	12.69	37.88	12.86	40
41	38.99	12.67	38.94	12.84	38.88	13.01	38.82	13.18	41
42	39.94	12.98	39.89	13.15	39.83	13.33	39.77	13.50	42
43	40.90	13.29	40.84	13.47	40.78	13.64	40.72	13.82	43
44	41.85	13.60	41.79	13.78	41.73	13.96	41.66	14.14	44
45	42.80	13.91	42.74	14.09	42.67	14.28	42.61	14.46	45
46	43.75	14.21	43.69	14.41	43.62	14.60	43.56	14.79	46
47	44.70	14.52	44.64	14.72	44.57	14.91	44.51	15.11	47
48	45.65	14.83	45.59	15.03	45.52	15.23	45.45	15.43	48
49	46.60	15.14	46.54	15.35	46.47	15.55	46.40	15.75	49
50	47.55	15.45	47.48	15.66	47.42	15.87	47.35	16.07	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	72 Deg.		71¾ Deg.		71½ Deg.		71¼ Deg.		

Dist.	18 Deg.		18¼ Deg.		18½ Deg.		18¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48.50	15.76	48.43	15.97	48.36	16.18	48.29	16.39	51
52	49.45	16.07	49.38	16.28	49.31	16.50	49.24	16.71	52
53	50.41	16.38	50.33	16.60	50.26	16.82	50.19	17.04	53
54	51.36	16.69	51.28	16.91	51.21	17.13	51.13	17.36	54
55	52.31	17.00	52.23	17.22	52.16	17.45	52.08	17.68	55
56	53.26	17.30	53.18	17.54	53.11	17.77	53.03	18.00	56
57	54.21	17.61	54.13	17.85	54.05	18.09	53.98	18.32	57
58	55.16	17.92	55.08	18.16	55.00	18.40	54.92	18.64	58
59	56.11	18.23	56.03	18.48	55.95	18.72	55.87	18.96	59
60	57.06	18.54	56.98	18.79	56.90	19.04	56.82	19.29	60
61	58.01	18.85	57.93	19.10	57.85	19.36	57.76	19.61	61
62	58.97	19.16	58.88	19.42	58.80	19.67	58.71	19.93	62
63	59.92	19.47	59.83	19.73	59.74	19.99	59.66	20.25	63
64	60.87	19.78	60.78	20.04	60.69	20.31	60.60	20.57	64
65	61.82	20.09	61.73	20.36	61.64	20.62	61.55	20.89	65
66	62.77	20.40	62.68	20.67	62.59	20.94	62.50	21.22	66
67	63.72	20.70	63.63	20.98	63.54	21.26	63.44	21.54	67
68	64.67	21.01	64.58	21.30	64.49	21.58	64.39	21.86	68
69	65.62	21.32	65.53	21.61	65.43	21.89	65.34	22.18	69
70	66.57	21.63	66.48	21.92	66.38	22.21	66.29	22.50	70
71	67.53	21.94	67.43	22.23	67.33	22.53	67.23	22.82	71
72	68.48	22.25	68.38	22.55	68.28	22.85	68.18	23.14	72
73	69.43	22.56	69.33	22.86	69.23	23.16	69.13	23.47	73
74	70.38	22.87	70.28	23.17	70.18	23.48	70.07	23.79	74
75	71.33	23.18	71.23	23.49	71.12	23.80	71.02	24.11	75
76	72.28	23.49	72.18	23.80	72.07	24.12	71.97	24.43	76
77	73.23	23.79	73.13	24.11	73.02	24.43	72.91	24.75	77
78	74.18	24.10	74.08	24.43	73.97	24.75	73.86	25.07	78
79	75.13	24.41	75.03	24.74	74.92	25.07	74.81	25.39	79
80	76.08	24.72	75.98	25.05	75.87	25.38	75.75	25.72	80
81	77.04	25.03	76.93	25.37	76.81	25.70	76.70	26.04	81
82	77.99	25.34	77.88	25.68	77.76	26.02	77.65	26.36	82
83	78.94	25.65	78.83	25.99	78.71	26.34	78.60	26.68	83
84	79.89	25.96	79.77	26.31	79.66	26.65	79.54	27.00	84
85	80.84	26.27	80.72	26.62	80.61	26.97	80.49	27.32	85
86	81.79	26.58	81.67	26.93	81.56	27.29	81.44	27.64	86
87	82.74	26.88	82.62	27.25	82.50	27.61	82.38	27.97	87
88	83.69	27.19	83.57	27.56	83.45	27.92	83.33	28.29	88
89	84.64	27.50	84.52	27.87	84.40	28.24	84.28	28.61	89
90	85.60	27.81	85.47	28.18	85.35	28.56	85.22	28.93	90
91	86.55	28.12	86.42	28.50	86.30	28.87	86.17	29.25	91
92	87.50	28.43	87.37	28.81	87.25	29.19	87.12	29.57	92
93	88.45	28.74	88.32	29.12	88.19	29.51	88.06	29.89	93
94	89.40	29.05	89.27	29.44	89.14	29.83	89.01	30.22	94
95	90.35	29.36	90.22	29.75	90.09	30.14	89.96	30.54	95
96	91.30	29.67	91.17	30.06	91.04	30.46	90.91	30.86	96
97	92.25	29.97	92.12	30.38	91.99	30.78	91.85	31.18	97
98	93.20	30.28	93.07	30.69	92.94	31.10	92.80	31.50	98
99	94.15	30.59	94.02	31.00	93.88	31.41	93.75	31.82	99
100	95.11	30.90	94.97	31.32	94.83	31.73	94.69	32.14	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	72 Deg.		71¾ Deg.		71½ Deg.		71¼ Deg.		

Dist.	19 Deg Lat.	Dep.	19¼ Deg. Lat.	Dep.	19½ Deg. Lat.	Dep.	19¾ Deg. Lat.	Dep.	Dist.
1	0.95	0.33	0.94	0.33	0.94	0.33	0.94	0.34	1
2	1.89	0.65	1.89	0.66	1.89	0.67	1.88	0.68	2
3	2.84	0.98	2.83	0.99	2.83	1.00	2.82	1.01	3
4	3.78	1.30	3.78	1.32	3.77	1.34	3.76	1.35	4
5	4.73	1.63	4.72	1.65	4.71	1.67	4.71	1.69	5
6	5.67	1.95	5.66	1.98	5.66	2.00	5.65	2.03	6
7	6.62	2.28	6.61	2.31	6.60	2.34	6.59	2.37	7
8	7.56	2.60	7.55	2.64	7.54	2.67	7.53	2.70	8
9	8.51	2.93	8.50	2.97	8.48	3.00	8.47	3.04	9
10	9.46	3.26	9.44	3.30	9.43	3.34	9.41	3.38	10
11	10.40	3.58	10.38	3.63	10.37	3.67	10.35	3.72	11
12	11.35	3.91	11.33	3.96	11.31	4.01	11.29	4.06	12
13	12.29	4.23	12.27	4.29	12.25	4.34	12.24	4.39	13
14	13.24	4.56	13.22	4.62	13.20	4.67	13.18	4.73	14
15	14.18	4.88	14.16	4.95	14.14	5.01	14.12	5.07	15
16	15.13	5.21	15.11	5.28	15.08	5.34	15.06	5.41	16
17	16.07	5.53	16.05	5.60	16.02	5.67	16.00	5.74	17
18	17.02	5.86	16.99	5.93	16.97	6.01	16.94	6.08	18
19	17.96	6.19	17.94	6.26	17.91	6.34	17.88	6.42	19
20	18.91	6.51	18.88	6.59	18.85	6.68	18.82	6.76	20
21	19.86	6.84	19.83	6.92	19.80	7.01	19.76	7.10	21
22	20.80	7.16	20.77	7.25	20.74	7.34	20.71	7.43	22
23	21.75	7.49	21.71	7.58	21.68	7.68	21.65	7.77	23
24	22.69	7.81	22.66	7.91	22.62	8.01	22.59	8.11	24
25	23.64	8.14	23.60	8.24	23.57	8.35	23.53	8.45	25
26	24.58	8.46	24.55	8.57	24.51	8.68	24.47	8.79	26
27	25.53	8.79	25.49	8.90	25.45	9.01	25.41	9.12	27
28	26.47	9.12	26.43	9.23	26.39	9.35	26.35	9.46	28
29	27.42	9.44	27.38	9.56	27.34	9.68	27.29	9.80	29
30	28.37	9.77	28.32	9.89	28.28	10.01	28.24	10.14	30
31	29.31	10.09	29.27	10.22	29.22	10.35	29.18	10.48	31
32	30.26	10.42	30.21	10.55	30.16	10.68	30.12	10.81	32
33	31.20	10.74	31.15	10.88	31.11	11.02	31.06	11.15	33
34	32.15	11.07	32.10	11.21	32.05	11.35	32.00	11.49	34
35	33.09	11.39	33.04	11.54	32.99	11.68	32.94	11.83	35
36	34.04	11.72	33.99	11.87	33.94	12.02	33.88	12.17	36
37	34.98	12.05	34.93	12.20	34.88	12.35	34.82	12.50	37
38	35.93	12.37	35.88	12.53	35.82	12.68	35.76	12.84	38
39	36.88	12.70	36.82	12.86	36.76	13.02	36.71	13.18	39
40	37.82	13.02	37.76	13.19	37.71	13.35	37.65	13.52	40
41	38.77	13.35	38.71	13.52	38.65	13.69	38.59	13.85	41
42	39.71	13.67	39.65	13.85	39.59	14.02	39.53	14.19	42
43	40.66	14.00	40.60	14.18	40.53	14.35	40.47	14.53	43
44	41.60	14.32	41.54	14.51	41.48	14.69	41.41	14.87	44
45	42.55	14.65	42.48	14.84	42.42	15.02	42.35	15.21	45
46	43.49	14.98	43.43	15.17	43.36	15.36	43.29	15.54	46
47	44.44	15.30	44.37	15.50	44.30	15.69	44.24	15.88	47
48	45.38	15.63	45.32	15.83	45.25	16.02	45.18	16.22	48
49	46.33	15.95	46.26	16.15	46.19	16.36	46.12	16.56	49
50	47.28	16.28	47.20	16.48	47.13	16.69	47.06	16.90	50
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	71 Deg.		70¾ Deg.		70½ Deg.		70¼ Deg.		

Dist.	19 Deg.		19¼ Deg		19½ Deg.		19¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48.22	16.60	48.15	16.81	48.07	17.02	48.00	17.23	51
52	49.17	16.93	49.09	17.14	49.02	17.36	48.94	17.57	52
53	50.11	17.26	50.04	17.47	49.96	17.69	49.88	17.91	53
54	51.06	17.58	50.98	17.80	50.90	18.03	50.82	18.25	54
55	52.00	17.91	51.92	18.13	51.85	18.36	51.76	18.59	55
56	52.95	18.23	52.87	18.46	52.79	18.69	52.71	18.92	56
57	53.89	18.56	53.81	18.79	53.73	19.03	53.65	19.26	57
58	54.84	18.88	54.76	19.12	54.67	19.36	54.59	19.60	58
59	55.79	19.21	55.70	19.45	55.62	19.69	55.53	19.94	59
60	56.73	19.53	56.65	19.78	56.56	20.03	56.47	20.27	60
61	57.68	19.86	57.59	20.11	57.50	20.36	57.41	20.61	61
62	58.62	20.19	58.53	20.44	58.44	20.70	58.35	20.95	62
63	59.57	20.51	59.48	20.77	59.39	21.03	59.29	21.29	63
64	60.51	20.84	60.42	21.10.	60.33	21.36	60.24	21.63	64
65	61.46	21.16	61.37	21.43	61.27	21.70	61.18	21.96	65
66	62.40	21.49	62.31	21.76	62.21	22.03	62.12	22.30	66
67	63.35	21.81	63.25	22.09	63.16	22.37	63.06	22.64	67
68	64.30	22.14	64.20	22.42	64.10	22.70	64.00	22.98	68
69	65.24	22.46	65.14	22.75	65.04	23.03	64.94	23.32	69
70	66.19	22.79	66.09	23.08	65.98	23.87	65.88	23.65	70
71	67.13	23.12	67.03	23.41	66.93	23.70	66.82	23.99	71
72	68.08	23.44	67.97	23.74	67.87	24.03	67.76	24.33	72
73	69.02	23.77	68.92	24.07	68.81	24.37	68.71	24.67	73
74	69.97	24.09	69.86	24.40	69.76	24.70	69.65	25.01	74
75	70.91	24.42	70.81	24.73	70.70	25.04	70.59	25.34	75
76	71.86	24.74	71.75	25.06	71.64	25.37	71.53	25.68	76
77	72.80	25.07	72.69	25.39	72.58	25.70	72.47	26.02	77
78	73.75	25.39	73.64	25.72	73.53	26.04	73.41	26.36	78
79	74.70	25.72	74.58	26.05	74.47	26.37	74.35	26.70	79
80	75.64	26.05	75.53	26.38	75.41	26.70	75.29	27.03	80
81	76.59	26.37	76.47	26.70	76.35	27.04	76.24	27.37	81
82	77.53	36.70	77.42	27.03	77.30	27.37	77.18	27.71	82
83	78.48	27.02	78.36	27.36	78.24	27.71	78.12	28.05	83
84	79.42	27.35	79.30	27.69	79.18	28.04	79.06	28.39	84
85	80.37	27.67	80.25	28.02	80.12	28.37	80.00	28.72	85
86	81.31	28.00	81.19	28.35	81.07	28.71	80.94	29.06	86
87	82.26	28.32	82.14	28.68	82.01	29.04	81.88	29.40	87
88	83.21	28.65	83.08	29.01	82.95	29.37	82.82	29.74	88
89	84.15	28.98	84.02	29.34	83.90	29.71	83.76	30.07	89
90	85.10	29.30	84.97	29.67	84.84	30.04	84.71	30.41	90
91	86.04	29.63	85.91	30.00	85.78	30.38	85.65	30.75	91
92	86.99	29.95	86.86	30.33	86.72	30.71	86.59	31.09	92
93	87.93	30.28	87.80	30.66	87.67	31.04	87.53	31.43	93
94	88.88	30.60	88.74	30.99	88.61	31.38	88.47	31.76	94
95	89.82	30.93	89.69	31.32	89.55	31.71	89.41	32.10	95
96	90.77	31.25	90.63	31.65	90.49	32.05	90.35	32.44	96
97	91.72	31.58	91.58	31.98	91.44	32.38	91.30	32.78	97
98	92.66	31.91	92.52	32.31	92.38	32.71	92.24	33.12	98
99	93.61	32.23	93.46	32.64	93.32	33.05	93.18	33.45	99
100	94.55	32.56	94.41	32.97	94.26	33.38	94.12	33.89	100
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	71 Deg.		70¾ Deg.		70½ Deg.		70¼ Deg.		

Dist	20 Deg.		20¼ Deg.		20½ Deg.		20¾ Deg.		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.94	0.34	0.94	0.35	0.94	0.35	0.94	0.35	1
2	1.88	0.68	1.88	0.69	1.87	0.70	1.87	0.71	2
3	2.82	1.03	2.81	1.04	2.81	1.05	2.81	1.06	3
4	3.76	1.37	3.75	1.38	3.75	1.40	3.74	1.42	4
5	4.70	1.71	4.69	1.73	4.68	1.75	4.68	1.77	5
6	5.64	2.05	5.63	2.08	5.62	2.10	5.61	2.13	6
7	6.58	2.39	6.57	2.43	6.56	2.45	6.55	2.48	7
8	7.52	2.74	7.51	2.77	7.49	2.80	7.48	2.83	8
9	8.46	3.08	8.44	3.12	8.43	3.15	8.42	3.19	9
10	9.40	3.42	9.38	3.46	9.37	3.50	9.35	3.54	10
11	10.34	3.76	10.32	3.81	10.30	3.85	10.29	3.90	11
12	11.28	4.10	11.26	4.15	11.24	4.20	11.22	4.25	12
13	12.22	4.45	12.20	4.50	12.18	4.55	12.16	4.61	13
14	13.16	4.79	13.13	4.85	13.11	4.90	13.09	4.96	14
15	14.10	5.13	14.07	5.19	14.05	5.25	14.03	5.31	15
16	15.04	5.47	15.01	5.54	14.99	5.60	14.96	5.67	16
17	15.97	5.81	15.95	5.88	15.92	5.95	15.90	6.02	17
18	16.91	6.16	16.89	6.23	16.86	6.30	16.83	6.38	18
19	17.85	6.50	17.83	6.58	17.80	6.65	17.77	6.73	19
20	18.79	6.84	18.76	6.92	18.73	7.00	18.70	7.09	20
21	19.73	7.18	19.70	7.27	19.67	7.35	19.64	7.44	21
22	20.67	7.52	20.64	7.61	20.61	7.70	20.57	7.79	22
23	21.61	7.87	21.58	7.96	21.54	8.05	21.51	8.15	23
24	22.55	8.21	22.52	8.31	22.48	8.40	22.44	8.50	24
25	23.49	8.55	23.45	8.65	23.42	8.76	23.38	8.86	25
26	24.43	8.89	24.39	9.00	24.35	9.11	24.31	9.21	26
27	25.37	9.23	25.33	9.35	25.29	9.46	25.25	9.57	27
28	26.31	9.58	26.27	9.69	26.23	9.81	26.18	9.92	28
29	27.25	9.92	27.21	10.04	27.16	10.16	27.12	10.27	29
30	28.19	10.26	28.15	10.38	28.10	10.51	28.05	10.63	30
31	29.13	10.60	29.08	10.73	29.04	10.86	28.99	10.98	31
32	30.07	10.94	30.02	11.08	29.97	11.21	29.92	11.34	32
33	31.01	11.29	30.96	11.42	30.91	11.56	30.86	11.69	33
34	31.95	11.63	31.90	11.77	31.85	11.91	31.79	12.05	34
35	32.89	11.97	32.84	12.11	32.78	12.26	32.73	12.40	35
36	33.83	12.31	33.77	12.46	33.72	12.61	33.66	12.75	36
37	34.77	12.65	34.71	12.81	34.66	12.96	34.60	13.11	37
38	35.71	13.00	35.65	13.15	35.59	13.31	35.54	13.46	38
39	36.65	13.34	36.59	13.50	36.53	13.66	36.47	13.82	39
40	37.59	13.68	37.53	13.84	37.47	14.01	37.41	14.17	40
41	38.53	14.02	38.47	14.19	38.40	14.36	38.34	14.53	41
42	39.47	14.36	39.40	14.54	39.34	14.71	39.28	14.88	42
43	40.41	14.71	40.34	14.88	40.28	15.06	40.21	15.23	43
44	41.35	15.05	41.28	15.23	41.21	15.41	41.15	15.59	44
45	42.29	15.39	42.22	15.58	42.15	15.76	42.08	15.94	45
46	43.23	15.73	43.16	15.92	43.09	16.11	43.02	16.30	46
47	44.17	16.07	44.09	16.27	44.02	16.46	43.95	16.65	47
48	45.11	16.42	45.03	16.61	44.96	16.81	44.89	17.01	48
49	46.04	16.76	45.97	16.96	45.90	17.16	45.82	17.36	49
50	46.98	17.10	46.91	17.31	46.83	17.51	46.76	17.71	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	70 Deg.		69¾ Deg.		69½ Deg.		69¼ Deg.		

Dist.	20 Deg. Lat.	Dep.	20¼ Deg. Lat.	Dep.	20½ Deg. Lat.	Dep.	20¾ Deg. Lat.	Dep.	Dist.
51	47.92	17.44	47.85	17.65	47.77	17.86	47.69	18.07	51
52	48.86	17.79	48.79	18.00	48.71	18.21	48.63	18.42	52
53	49.80	18.13	49.72	18.34	49.64	18.56	49.56	18.78	53
54	50.74	18.47	50.66	18.69	50.58	18.91	50.50	19.13	54
55	51.68	18.81	51.60	19.04	51.52	19.26	51.43	19.49	55
56	52.62	19.15	52.54	19.38	52.45	19.61	52.37	19.84	56
57	53.56	19.50	53.48	19.73	53.39	19.96	53.30	20.19	57
58	54.50	19.84	54.42	20.07	54.33	20.31	54.24	20.55	58
59	55.44	20.18	55.35	20.42	55.26	20.66	55.17	20.90	59
60	56.38	20.52	56.29	20.77	56.20	21.01	56.11	21.26	60
61	57.32	20.86	57.23	21.11	57.14	21.36	57.04	21.61	61
62	58.26	21.21	58.17	21.46	58.07	21.71	57.98	21.97	62
63	59.20	21.55	59.11	21.81	59.01	22.06	58.91	22.32	63
64	60.14	21.89	60.04	22.15	59.95	22.41	59.85	22.67	64
65	61.08	22.23	60.98	22.50	60.88	22.76	60.78	23.03	65
66	62.02	22.57	61.92	22.84	61.82	23.11	61.72	23.38	66
67	62.96	22.92	62.86	23.19	62.76	23.46	62.65	23.74	67
68	63.90	23.26	63.80	23.54	63.69	23.81	63.59	24.09	68
69	64.84	23.60	64.74	23.88	64.63	24.16	64.52	24.45	69
70	65.78	23.94	65.67	24.23	65.57	24.51	65.46	24.80	70
71	66.72	24.28	66.61	24.57	66.50	24.86	66.39	25.15	71
72	67.66	24.63	67.55	24.92	67.44	25.21	67.33	25.51	72
73	68.60	24.97	68.49	25.27	68.38	25.57	68.26	25.86	73
74	69.54	25.31	69.43	25.61	69.31	25.92	69.20	26.22	74
75	70.48	25.65	70.36	25.96	70.25	26.27	70.14	26.57	75
76	71.42	25.99	71.30	26.30	71.19	26.62	71.07	26.93	76
77	72.36	26.34	72.24	26.65	72.12	26.97	72.01	27.28	77
78	73.30	26.68	73.18	27.00	73.06	27.32	72.94	27.63	78
79	74.24	27.02	74.12	27.34	74.00	27.67	73.88	27.99	79
80	75.18	27.36	75.06	27.69	74.93	28.02	74.81	28.34	80
81	76.12	27.70	75.99	28.04	75.87	28.37	75.75	28.70	81
82	77.05	28.05	76.93	28.38	76.81	28.72	76.68	29.05	82
83	77.99	28.39	77.87	28.73	77.74	29.07	77.62	29.41	83
84	78.93	28.73	78.81	29.07	78.68	29.42	78.55	29.76	84
85	79.87	29.07	79.75	29.42	79.62	29.77	79.49	30.11	85
86	80.81	29.41	80.68	29.77	80.55	30.12	80.42	30.47	86
87	81.75	29.76	81.62	30.11	81.49	30.47	81.36	30.82	87
88	82.69	30.10	82.56	30.46	82.43	30.82	82.29	31.18	88
89	83.63	30.44	83.50	30.80	83.36	31.17	83.23	31.53	89
90	84.57	30.78	84.44	31.15	84.30	31.52	84.16	31.89	90
91	85.51	31.12	85.38	31.50	85.24	31.87	85.10	32.24	91
92	86.45	31.47	86.31	31.84	86.17	32.22	86.03	32.59	92
93	87.39	31.81	87.25	32.19	87.11	32.57	86.97	32.95	93
94	88.33	32.15	88.19	32.54	88.05	32.92	87.90	33.30	94
95	89.27	32.49	89.13	32.88	88.98	33.27	88.84	33.66	95
96	90.21	32.83	90.07	33.23	89.92	33.62	89.77	34.01	96
97	91.15	33.18	91.00	33.57	90.86	33.97	90.71	34.37	97
98	92.09	33.52	91.94	33.92	91.79	34.32	91.64	34.72	98
99	93.03	33.86	92.88	34.27	92.73	34.67	92.58	35.07	99
100	93.97	34.20	93.82	34.61	93.67	35.02	93.51	35.43	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dist.
	70 Deg.		69¾ Deg		69½ Deg.		69¼ Deg.		

1 F

Dist	22 Deg. Lat.	Dep.	22¼ Deg. Lat.	Dep.	22½ Deg Lat.	Dep.	22¾ Deg. Lat.	Dep.	Dist
1	0.93	0.37	0.93	0.38	0.92	0.38	0.92	0.39	1
2	1.85	0.75	1.85	0.76	1.85	0.77	1.84	0.77	2
3	2.78	1.12	2.78	1.14	2.77	1.15	2.77	1.61	3
4	3.71	1.50	3.70	1.51	3.70	1.53	3.69	1.55	4
5	4.64	1.87	4.63	1.89	4.62	1.91	4.61	1.93	5
6	5.56	2.25	5.55	2.27	5.54	2.30	5.53	2.32	6
7	6.49	2.62	6.48	2.65	6.47	2.68	6.46	2.71	7
8	7.42	3.00	7.40	3.03	7.39	3.06	7.38	3.09	8
9	8.34	3.37	8.33	3.41	8.31	3.44	8.30	3.48	9
10	9.27	3.75	9.26	3.79	9.24	3.83	9.22	3.87	10
11	10.20	4.12	10.18	4.17	10.16	4.21	10.14	4.25	11
12	11.13	4.50	11.11	4.54	11.09	4.59	11.07	4.64	12
13	12.05	4.87	12.03	4.92	12.01	4.97	11.99	5.03	13
14	12.98	5.24	12.96	5.50	12.93	5.36	12.91	5.41	14
15	13.91	5.62	13.88	5.68	13.86	5.74	13.83	5.80	15
16	14.83	5.99	14.81	6.06	14.78	6.12	14.76	6.19	16
17	15.76	6.37	15.73	6.44	15.71	6.51	15.68	6.57	17
18	16.69	6.74	16.66	6.82	16.63	6.89	16.60	6.96	18
19	17.62	7.12	17.59	7.19	17.55	7.27	17.52	7.35	19
20	18.54	7.49	18.51	7.57	18.48	7.65	18.44	7.73	20
21	19.47	7.87	19.44	7.95	19.40	8.04	19.37	8.12	21
22	20.40	8.24	20.36	8.33	20.33	8.42	20.29	8.51	22
23	21.33	8.62	21.29	8.71	21.25	8.80	21.21	8.89	23
24	22.25	8.99	22.21	9.09	22.17	9.18	22.13	9.28	24
25	23.18	9.37	23.14	9.47	23.10	9.57	23.06	9.67	25
26	24.11	9.74	24.06	9.84	24.02	9.95	23.98	10.05	26
27	25.03	10.11	24.99	10.22	24.94	10.33	24.90	10.44	27
28	25.96	10.49	25.92	10.60	25.87	10.72	25.82	10.83	28
29	26.89	10.86	26.84	10.98	26.79	11.10	26.74	11.21	29
30	27.82	11.24	27.77	11.36	27.72	11.48	27.67	11.60	30
31	28.74	11.61	28.69	11.74	28.64	11.86	28.59	11.99	31
32	29.67	11.99	29.62	12.12	29.56	12.25	29.51	12.37	32
33	30.60	12.36	30.54	12.50	30.49	12.63	30.43	12.76	33
34	31.52	12.74	31.47	12.87	31.41	13.01	31.35	13.15	34
35	32.45	13.11	32.39	13.25	32.34	13.39	32.28	13.53	35
36	33.38	13.49	33.32	13.63	33.26	13.78	33.20	13.92	36
37	34.31	13.86	34.24	14.01	34.18	14.16	34.12	14.31	37
38	35.23	14.24	35.17	14.39	35.11	14.54	35.04	14.70	38
39	36.16	14.61	36.10	14.77	36.03	14.92	35.97	15.08	39
40	37.09	14.98	37.02	15.15	36.96	15.31	36.89	15.47	40
41	38.01	15.36	37.95	15.52	37.88	15.69	37.81	15.86	41
42	38.94	15.73	38.87	15.90	38.80	16.07	38.73	16.24	42
43	39.87	16.11	39.80	16.28	39.73	16.46	39.65	16.63	43
44	40.80	16.48	40.72	16.66	40.65	16.84	40.58	17.02	44
45	41.72	16.86	41.65	17.04	41.57	17.22	41.50	17.40	45
46	42.65	17.23	42.57	17.42	42.50	17.60	42.42	17.79	46
47	43.58	17.61	43.50	17.80	43.42	17.99	43.34	18.18	47
48	44.50	17.98	44.43	18.18	44.35	18.37	44.27	18.56	48
49	45.43	18.36	45.35	18.55	45.27	18.75	45.19	18.95	49
50	46.36	18.73	46.28	18.93	46.19	19.13	46.11	19.34	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dist.
	68 Deg.		67¾ Deg		67½ Deg.		67¼ Deg		

Dist.	22 Deg.		22¼ Deg.		22½ Deg.		22¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat	Dep	Lat.	Dep.	
51	47.29	19.10	47.20	19.31	47.12	19.52	47.03	19.72	51
52	48.21	19.48	48.13	19.69	48.04	19.90	47.95	20.11	52
53	49.14	19.85	49.05	20.07	48.97	20.28	48.88	20.50	53
54	50.07	20.23	49.98	20.45	49.89	20.66	49.80	20.88	54
55	51.00	20.60	50.90	20.83	50.81	21.05	50.72	21.27	55
56	51.92	20.98	51.83	21.20	51.74	21.43	51.64	21.66	56
57	52.85	21.35	52.76	21.58	52.66	21.81	52.57	22.04	57
58	53.78	21.73	53.68	21.96	53.59	22.20	53.49	22.43	58
59	54.70	22.10	54.61	22.34	54.51	22.58	54.41	22.82	59
60	55.63	22.48	55.53	22.72	55.43	22.96	55.33	23.20	60
61	56.56	22.85	56.47	23.10	56.36	23.34	56.25	23.59	61
62	57.49	23.23	57.38	23.48	57.28	23.73	57.18	23.98	62
63	58.41	23.60	58.31	23.85	58.20	24.11	58.10	24.36	63
64	59.34	23.97	59.23	24.23	59.13	24.49	59.02	24.75	64
65	60.27	24.35	60.16	24.61	60.05	24.87	59.94	25.14	65
66	61.19	24.72	61.09	24.99	60.98	25.26	60.87	25.52	66
67	62.12	25.10	62.01	25.37	61.90	25.64	61.79	25.91	67
68	63.05	25.47	62.94	25.75	62.82	26.02	62.71	26.30	68
69	63.98	25.85	63.86	26.13	63.75	26.41	63.63	26.68	69
70	64.90	26.22	64.79	26.51	64.67	26.79	64.55	27.07	70
71	65.83	26.60	65.71	26.88	65.60	27.17	65.48	27.46	71
72	66.76	26.97	66.64	27.26	66.52	27.55	66.40	27.84	72
73	67.68	27.35	67.56	27.64	67.44	27.94	67.32	28.23	73
74	68.61	27.72	68.49	28.02	68.37	28.32	68.24	28.62	74
75	69.54	28.10	69.42	28.40	69.29	28.70	69.17	29.00	75
76	70.47	28.47	70.34	28.78	70.21	29.08	70.09	29.39	76
77	71.39	28.84	71.27	29.16	71.14	29.47	71.01	29.78	77
78	72.32	29.22	72.19	29.53	72.06	29.85	71.93	30.16	78
79	73.25	29.59	73.12	29.91	72.99	30.23	72.85	30.55	79
80	74.17	29.97	74.04	30.29	73.91	30.61	73.78	30.94	80
81	75.10	30.34	74.97	30.67	74.83	31.00	74.70	31.32	81
82	76.03	30.72	75.89	31.05	75.76	31.38	75.62	31.71	82
83	76.96	31.09	76.82	31.43	76.68	31.76	76.54	32.10	83
84	77.88	31.47	77.75	31.81	77.61	32.15	77.46	32.48	84
85	78.81	31.84	78.67	32.19	78.53	32.53	78.39	32.87	85
86	79.74	32.22	79.60	32.56	79.45	32.91	79.31	33.26	86
87	80.66	32.59	80.52	32.94	80.38	33.29	80.23	33.64	87
88	81.59	32.97	81.45	33.32	81.30	33.68	81.15	34.03	88
89	82.52	33.34	82.37	33.70	82.23	34.06	82.08	34.42	89
90	83.45	33.71	83.30	34.08	83.15	34.44	83.00	34.80	90
91	84.37	34.09	84.22	34.46	84.07	34.82	83.92	35.19	91
92	85.30	34.46	85.15	34.84	85.00	35.21	84.84	35.58	92
93	86.23	34.84	86.08	35.21	85.92	35.59	85.76	35.96	93
94	87.16	35.21	87.00	35.59	86.84	35.97	86.69	36.35	94
95	88.08	35.59	87.93	35.97	87.77	36.35	87.61	36.74	95
96	89.01	35.96	88.85	36.35	88.69	36.74	88.53	37.12	96
97	89.94	36.34	89.78	36.73	89.62	37.12	89.45	37.51	97
98	90.86	36.71	90.70	37.11	90.54	37.50	90.38	37.90	98
99	91.79	37.09	91.63	37.49	91.46	37.89	91.30	38.28	99
100	92.72	37.46	92.55	37.86	92.39	38.27	92.22	38.67	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	68 Deg.		67¾ Deg.		67½ Deg.		67¼ Deg.		

Dist	23 Deg Lat.	Dep.	23¼ Deg. Lat.	Dep.	23½ Deg. Lat.	Dep.	23¾ Deg. Lat.	Dep.	Dist
1	0.92	0.39	0.92	0.39	0.92	0.40	0.92	0.40	1
2	1.84	0.78	1.84	0.79	1.83	0.80	1.83	0.81	2
3	2.76	1.17	2.76	1.18	2.75	1.20	2.75	1.21	3
4	3.68	1.56	3.68	1.58	3.67	1.59	3.66	1.61	4
5	4.60	1.95	4.59	1.97	4.59	1.99	4.58	2.01	5
6	5.52	2.34	5.51	2.37	5.50	2.39	5.49	2.42	6
7	6.44	2.74	6.43	2.76	6.42	2.79	6.41	2.82	7
8	7.36	3.13	7.35	3.16	7.34	3.19	7.32	3.22	8
9	8.28	3.52	8.27	3.55	8.25	3.59	8.24	3.62	9
10	9.20	3.91	9.19	3.95	9.17	3.99	9.15	4.03	10
11	10.13	4.30	10.11	4.34	10.09	4.39	10.07	4.43	11
12	11.05	4.69	11.03	4.74	11.00	4.78	10.98	4.83	12
13	11.97	5.08	11.94	5.13	11.92	5.18	11.90	5.24	13
14	12.89	5.47	12.86	5.53	12.84	5.58	12.81	5.64	14
15	13.81	5.86	13.78	5.92	13.76	5.98	13.73	6.04	15
16	14.73	6.25	14.70	6.32	14.67	6.38	14.64	6.44	16
17	15.65	6.64	15.62	6.71	15.59	6.78	15.56	6.85	17
18	16.57	7.03	16.54	7.11	16.51	7.18	16.48	7.25	18
19	17.49	7.42	17.46	7.50	17.42	7.58	17.39	7.65	19
20	18.41	7.81	18.38	7.89	18.34	7.97	18.31	8.05	20
21	19.33	8.21	19.29	8.29	19.26	8.37	19.22	8.46	21
22	20.25	8.60	20.21	8.68	20.18	8.77	20.14	8.86	22
23	21.17	8.99	21.13	9.08	21.09	9.17	21.05	9.26	23
24	22.09	9.38	22.05	9.47	22.01	9.57	21.97	9.67	24
25	23.01	9.77	22.97	9.87	22.93	9.97	22.88	10.07	25
26	23.93	10.16	23.89	10.26	23.84	10.37	23.80	10.47	26
27	24.85	10.55	24.81	10.66	24.76	10.77	24.71	10.87	27
28	25.77	10.94	25.73	11.05	25.68	11.16	25.63	11.28	28
29	26.69	11.33	26.64	11.45	26.59	11.56	26.54	11.68	29
30	27.62	11.72	27.56	11.84	27.51	11.96	27.46	12.08	30
31	28.54	12.11	28.48	12.24	28.43	12.36	28.37	12.49	31
32	29.46	12.50	29.40	12.63	29.35	12.76	29.29	12.89	32
33	30.38	12.89	30.32	13.03	30.26	13.16	30.21	13.29	33
34	31.30	13.28	31.24	13.42	31.18	13.56	31.12	13.69	34
35	32.22	13.68	32.16	13.82	32.10	13.96	32.04	14.10	35
36	33.14	14.07	33.08	14.21	33.01	14.35	32.95	14.50	36
37	34.06	14.46	34.00	14.61	33.93	14.75	33.87	14.90	37
38	34.98	14.85	34.91	15.00	34.85	15.15	34.78	15.30	38
39	35.90	15.24	35.83	15.39	35.77	15.55	35.70	15.71	39
40	36.82	15.63	36.75	15.79	36.68	15.95	36.61	16.11	40
41	37.74	16.02	37.67	16.18	37.60	16.35	37.53	16.51	41
42	38.66	16.41	38.59	16.58	38.52	16.75	38.44	16.92	42
43	39.58	16.80	39.51	16.97	39.43	17.15	39.36	17.32	43
44	40.50	17.19	40.43	17.37	40.35	17.54	40.27	17.72	44
45	41.42	17.58	41.35	17.76	41.27	17.94	41.19	18.12	45
46	42.34	17.97	42.26	18.16	42.18	18.34	42.10	18.53	46
47	43.26	18.36	43.18	18.55	43.10	18.74	43.02	18.93	47
48	44.18	18.76	44.10	18.95	44.02	19.14	43.93	19.33	48
49	45.10	19.15	45.02	19.34	44.94	19.54	44.85	19.73	49
50	46.03	19.54	45.94	19.74	45.85	19.94	45.77	20.14	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	67 Deg.		66¾ Deg		66½ Deg.		66¼ Deg.		

Dist.	24 Deg. Lat.	Dep.	24¼ Deg. Lat.	Dep.	24½ Deg. Lat.	Dep.	24¾ Deg Lat.	Dep.	Dist.
51	46.59	20.74	46.50	20.95	46.41	21.15	46.32	21.35	51
52	47.50	21.15	47.41	21.36	47.32	21.56	47.22	21.77	52
53	48.42	21.56	48.32	21.77	48.23	21.98	48.13	22.19	53
54	49.33	21.96	49.24	22.18	49.14	22.39	49.04	22.61	54
55	50.24	22.37	50.15	22.59	50.05	22.81	49.95	23.03	55
56	51.16	22.78	51.06	23.00	50.96	23.22	50.86	23.44	56
57	52.07	23.18	51.97	23.41	51.87	23.64	51.76	23.86	57
58	52.99	23.59	52.88	23.82	52.78	24.05	52.67	24.28	58
59	53.90	24.00	53.79	24.23	53.69	24.47	53.58	24.70	59
60	54.81	24.40	54.71	24.64	54.60	24.88	54.49	25.12	60
61	55.73	24.81	55.62	25.05	55.51	25.30	55.40	25.54	61
62	56.64	25.22	56.53	25.46	56.42	25.71	56.30	25.96	62
63	57.55	25.62	57.44	25.88	57.33	26.13	57.21	26.38	63
64	58.47	26.03	58.35	26.29	58.24	26.54	58.12	26.79	64
65	59.38	26.44	59.26	26.70	59.15	26.96	59.03	27.21	65
66	60.29	26.84	60.18	27.11	60.06	27.37	59.94	27.63	66
67	61.21	27.25	61.09	27.52	60.97	27.78	60.85	28.05	67
68	62.12	27.66	62.00	27.93	61.88	28.20	61.75	28.47	68
69	63.03	28.06	62.91	28.34	62.79	28.61	62.66	28.89	69
70	63.95	28.47	63.82	28.75	63.70	29.03	63.57	29.31	70
71	64.86	28.88	64.74	29.16	64.61	29.44	64.48	29.72	71
72	65.78	29.28	65.65	29.57	65.52	29.86	65.39	30.14	72
73	66.69	29.69	66.56	29.98	66.43	30.27	66.29	30.56	73
74	67.60	30.10	67.47	30.39	67.34	30.69	67.20	30.98	74
75	68.52	30.51	68.38	30.80	68.25	31.10	68.11	31.40	75
76	69.43	30.91	69.29	31.21	69.16	31.52	69.02	31.82	76
77	70.34	31.32	70.21	31.63	70.07	31.93	69.93	32.24	77
78	71.26	31.73	71.12	32.04	70.98	32.35	70.84	32.66	78
79	72.17	32.13	72.03	32.45	71.89	32.76	71.74	33.07	79
80	73.08	32.54	72.94	32.86	72.80	33.18	72.65	33.49	80
81	74.00	32.95	73.85	33.27	73.71	33.59	73.56	33.91	81
82	74.91	33.35	74.76	33.68	74.62	34.00	74.47	34.33	82
83	75.82	33.76	75.68	34.09	75.53	34.42	75.38	34.75	83
84	76.74	34.17	76.59	34.50	76.44	34.83	76.28	35.17	84
85	77.65	34.57	77.50	34.91	77.35	35.25	77.19	35.59	85
86	78.56	34.98	78.41	35.32	78.26	35.66	78.10	36.00	86
87	79.48	35.39	79.32	35.73	79.17	36.08	79.01	36.42	87
88	80.39	35.79	80.24	36.14	80.08	36.49	79.92	36.84	88
89	81.31	36.20	81.15	36.55	80.99	36.91	80.82	37.26	89
90	82.22	36.61	82.06	36.96	81.90	37.32	81.73	37.68	90
91	83.13	37.01	82.97	37.38	82.81	37.74	82.64	38.10	91
92	84.05	37.42	83.88	37.79	83.72	38.15	83.55	38.52	92
93	84.96	37.83	84.79	38.20	84.63	38.57	84.46	38.94	93
94	85.87	38.23	85.71	38.61	85.54	38.98	85.37	39.35	94
95	86.79	38.64	86.62	39.02	86.45	39.40	86.27	39.77	95
96	87.70	39.05	87.53	39.43	87.36	39.81	87.18	40.19	96
97	88.61	39.45	88.44	39.84	88.27	40.23	88.09	40.61	97
98	89.53	39.86	89.35	40.25	89.18	40.64	89.00	41.03	98
99	90.44	40.27	90.26	40.66	90.09	41.05	89.91	41.45	99
100	91.35	40.67	91.18	41.07	91.00	41.47	90.81	41.87	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	66 Deg.		65¾ Deg.		65½ Deg.		65¼ Deg		

1 G

Dist.	24 Deg.		24¼ Deg.		24½ Deg.		24¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.91	0.41	0.91	0.41	0.91	0.42	0.91	0.42	1
2	1.83	0.81	1.82	0.82	1.82	0.83	1.82	0.84	2
3	2.74	1.22	2.74	1.23	2.73	1.24	2.72	1.26	3
4	3.65	1.63	3.65	1.64	3.64	1.66	3.63	1.67	4
5	4.57	2.03	4.56	2.05	4.55	2.07	4.54	2.09	5
6	5.48	2.44	5.47	2.46	5.46	2.49	5.45	2.51	6
7	6.39	2.85	6.38	2.87	6.37	2.90	6.36	2.93	7
8	7.31	3.25	7.29	3.29	7.28	3.32	7.27	3.35	8
9	8.22	3.66	8.21	3.70	8.19	3.73	8.17	3.77	9
10	9.14	4.07	9.12	4.11	9.10	4.15	9.08	4.19	10
11	10.05	4.47	10.03	4.52	10.01	4.56	9.99	4.61	11
12	10.96	4.88	10.94	4.93	10.92	4.98	10.90	5.02	12
13	11.88	5.29	11.85	5.34	11.83	5.39	11.81	5.44	13
14	12.79	5.69	12.76	5.75	12.74	5.81	12.71	5.86	14
15	13.70	6.10	13.68	6.16	13.65	6.22	13.62	6.28	15
16	14.62	6.51	14.59	6.57	14.56	6.64	14.53	6.70	16
17	15.53	6.92	15.50	6.98	15.47	7.05	15.44	7.12	17
18	16.44	7.32	16.41	7.39	16.38	7.46	16.35	7.54	18
19	17.36	7.73	17.32	7.80	17.29	7.88	17.25	7.95	19
20	18.27	8.13	18.24	8.21	18.30	8.29	18.16	8.37	20
21	19.18	8.54	19.15	8.62	19.11	8.71	19.07	8.79	21
22	20.10	8.95	20.06	9.04	20.02	9.12	19.98	9.21	22
23	21.01	9.35	20.97	9.45	20.93	9.54	20.89	9.63	23
24	21.93	9.76	21.88	9.86	21.84	9.95	21.80	10.05	24
25	22.84	10.17	22.79	10.27	22.75	10.37	22.70	10.47	25
26	23.75	10.58	23.71	10.68	23.66	10.78	23.61	10.89	26
27	24.67	10.98	24.62	11.09	24.57	11.20	24.52	11.30	27
28	25.58	11.39	25.53	11.50	25.48	11.61	25.43	11.72	28
29	26.49	11.80	26.44	11.91	26.39	12.02	26.34	12.14	29
30	27.41	12.20	27.35	12.32	27.30	12.44	27.24	12.56	30
31	28.32	12.61	28.26	12.73	28.21	12.86	28.15	12.98	31
32	29.23	13.02	29.18	13.14	29.12	13.27	29.06	13.40	32
33	30.15	13.42	30.09	13.55	30.03	13.68	29.97	13.82	33
34	31.06	13.83	31.00	13.96	30.94	14.10	30.88	14.23	34
35	31.97	14.24	31.91	14.38	31.85	14.51	31.78	14.65	35
36	32.89	14.64	32.82	14.79	32.76	14.93	32.69	15.07	36
37	33.80	15.05	33.74	15.20	33.67	15.34	33.60	15.49	37
38	34.71	15.46	34.65	15.61	34.58	15.76	34.51	15.91	38
39	35.63	15.85	35.56	16.02	35.49	16.17	35.42	16.33	39
40	36.54	16.27	36.47	16.43	36.40	16.59	36.33	16.75	40
41	37.46	16.68	37.38	16.84	37.31	17.00	37.23	17.16	41
42	38.37	17.08	38.29	17.25	38.22	17.42	38.14	17.58	42
43	39.28	17.49	39.21	17.66	39.13	17.83	39.05	18.00	43
44	40.20	17.90	40.12	18.07	40.04	18.25	39.96	18.42	44
45	41.11	18.30	41.03	18.48	40.95	18.66	40.87	18.84	45
46	42.02	18.71	41.94	18.89	41.86	19.08	41.77	19.26	46
47	42.94	19.12	42.85	19.30	42.77	19.49	42.68	19.68	47
48	43.85	19.52	43.76	19.71	43.68	19.91	43.59	20.10	48
49	44.76	19.93	44.68	20.13	44.59	20.32	44.50	20.51	49
50	45.68	20.34	45.59	20.54	45.50	20.73	45.41	20.93	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	66 Deg.		65¾ Deg.		65½ Deg.		65¼ Deg.		

Dist.	24 Deg. Lat.	Dep.	24¼ Deg. Lat.	Dep.	24½ Deg. Lat.	Dep.	24¾ Deg Lat.	Dep.	Dist.
51	46.59	20.74	46.50	20.95	46.41	21.15	46.32	21.35	51
52	47.50	21.15	47.41	21.36	47.32	21.56	47.22	21.77	52
53	48.42	21.56	48.32	21.77	48.23	21.98	48.13	22.19	53
54	49.33	21.96	49.24	22.18	49.14	22.39	49.04	22.61	54
55	50.24	22.37	50.15	22.59	50.05	22.81	49.95	23.03	55
56	51.16	22.78	51.06	23.00	50.96	23.22	50.86	23.44	56
57	52.07	23.18	51.97	23.41	51.87	23.64	51.76	23.86	57
58	52.99	23.59	52.88	23.82	52.78	24.05	52.67	24.28	58
59	53.90	24.00	53.79	24.23	53.69	24.47	53.58	24.70	59
60	54.81	24.40	54.71	24.64	54.60	24.88	54.49	25.12	60
61	55.73	24.81	55.62	25.05	55.51	25.30	55.40	25.54	61
62	56.64	25.22	56.53	25.46	56.42	25.71	56.30	25.96	62
63	57.55	25.62	57.44	25.88	57.33	26.13	57.21	26.38	63
64	58.47	26.03	58.35	26.29	58.24	26.54	58.12	26.79	64
65	59.38	26.44	59.26	26.70	59.15	26.96	59.03	27.21	65
66	60.29	26.84	60.18	27.11	60.06	27.37	59.94	27.63	66
67	61.21	27.25	61.09	27.52	60.97	27.78	60.85	28.05	67
68	62.12	27.66	62.00	27.93	61.88	28.20	61.75	28.47	68
69	63.03	28.06	62.91	28.34	62.79	28.61	62.66	28.89	69
70	63.95	28.47	63.82	28.75	63.70	29.03	63.57	29.31	70
71	64.86	28.88	64.74	29.16	64.61	29.44	64.48	29.72	71
72	65.78	29.28	65.65	29.57	65.52	29.86	65.39	30.14	72
73	66.69	29.69	66.56	29.98	66.43	30.27	66.29	30.56	73
74	67.60	30.10	67.47	30.39	67.34	30.69	67.20	30.98	74
75	68.52	30.51	68.38	30.80	68.25	31.10	68.11	31.40	75
76	69.43	30.91	69.29	31.21	69.16	31.52	69.02	31.82	76
77	70.34	31.32	70.21	31.63	70.07	31.93	69.93	32.24	77
78	71.26	31.73	71.12	32.04	70.98	32.35	70.84	32.66	78
79	72.17	32.13	72.03	32.45	71.89	32.76	71.74	33.07	79
80	73.08	32.54	72.94	32.86	72.80	33.18	72.65	33.49	80
81	74.00	32.95	73.85	33.27	73.71	33.59	73.56	33.91	81
82	74.91	33.35	74.76	33.68	74.62	34.00	74.47	34.33	82
83	75.82	33.76	75.68	34.09	75.53	34.42	75.38	34.75	83
84	76.74	34.17	76.59	34.50	76.44	34.83	76.28	35.17	84
85	77.65	34.57	77.50	34.91	77.35	35.25	77.19	35.59	85
86	78.56	34.98	78.41	35.32	78.26	35.66	78.10	36.00	86
87	79.48	35.39	79.32	35.73	79.17	36.08	79.01	36.42	87
88	80.39	35.79	80.24	36.14	80.08	36.49	79.92	36.84	88
89	81.31	36.20	81.15	36.55	80.99	36.91	80.82	37.26	89
90	82.22	36.61	82.06	36.96	81.90	37.32	81.73	37.68	90
91	83.13	37.01	82.97	37.38	82.81	37.74	82.64	38.10	91
92	84.05	37.42	83.88	37.79	83.72	38.15	83.55	38.52	92
93	84.96	37.83	84.79	38.20	84.63	38.57	84.46	38.94	93
94	85.87	38.23	85.71	38.61	85.54	38.98	85.37	39.35	94
95	86.79	38.64	86.62	39.02	86.45	39.40	86.27	39.77	95
96	87.70	39.05	87.53	39.43	87.36	39.81	87.18	40.19	96
97	88.61	39.45	88.44	39.84	88.27	40.23	88.09	40.61	97
98	89.53	39.86	89.35	40.25	89.18	40.64	89.00	41.03	98
99	90.44	40.27	90.26	40.66	90.09	41.05	89.91	41.45	99
100	91.35	40.67	91.18	41.07	91.00	41.47	90.81	41.87	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	66 Deg.		65¾ Deg.		65½ Deg.		65¼ Deg		

1 G

Dist	26 Deg		26¼ Deg		26½ Deg		26¾ Deg		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.90	0.44	0.90	0.44	0·89	0.45	0.89	0.45	1
2	1.80	0.88	1.79	0.88	1.79	0.89	1.79	0.90	2
3	2.70	1.32	2.69	1.33	2.68	1.34	2.68	1.35	3
4	3.60	1.75	3.59	1.77	3.58	1.78	3.57	1.80	4
5	4.49	2.19	4.48	2.21	4.47	2.23	4.46	2.25	5
6	5.39	2.63	5.38	2.65	5.37	2.68	5.36	2.70	6
7	6.29	3.07	6.28	3.10	6.26	3.12	6.25	3.15	7
8	7.19	3.51	7.17	3.34	7.16	3·57	7.14	3.60	8
9	8.09	3.95	8.07	3.98	8.05	4.02	8.04	4.05	9
10	8.99	4.38	8.97	4.42	8.95	4.46	8.93	4.50	10
11	9.89	4.82	9.87	4.87	9.84	4.91	9.82	4.95	11
12	10.79	5.26	10.76	5.31	10.74	5.35	10.72	5.40	12
13	11.68	5.70	11.66	5.75	11.63	5.80	11.61	5.85	13
14	12.58	6.14	12.56	6.19	12.53	6.25	12.50	6.30	14
15	13.48	6.58	13.45	6.63	13.42	6.69	13.39	6.75	15
16	14.38	7.01	14.35	7.08	14.32	7.14	14.29	7.20	16
17	15.28	7.45	15.25	7.52	15.21	7.59	15.18	7.65	17
18	16.18	7.89	16.14	7.96	16.11	8.03	16.07	8.10	18
19	17.08	8.33	17.04	8.40	17.00	8.48	16.97	8.55	19
20	17.98	8.77	17.94	8.85	17.90	8.92	17.86	9.00	20
21	18.87	9.21	18.83	9.29	18.79	9.37	18.75	9.45	21
22	19.77	9·64	19.73	9.73	19.69	9.82	19.65	9.90	22
23	20.67	10.08	20.63	10.17	20.58	10.26	20.54	10.35	23
24	21.57	10.52	21.52	10.61	21.48	10.71	21.43	10.80	24
25	22.47	10.96	22.42	11.06	22.37	11.15	22.32	11.25	25
26	23.37	11.40	23.32	11.50	23.27	11.60	23.22	11.70	26
27	24.27	11.84	24.22	11.94	24.16	12.05	24.11	12.15	27
28	25.17	12.27	25.11	12.38	25.06	11.49	25.00	12.60	28
29	26.06	12.71	26.01	12.83	25.95	12.94	25.90	13.05	29
30	26.96	13.15	26.91	13.27	26.85	13.39	26.79	13.50	30
31	27.86	13.59	27.80	13.71	27.74	13.83	27.68	13·95	31
32	28.76	14.03	28.70	14.15	28.64	14.28	28.58	14.40	32
33	29.66	14.47	29.60	14.60	29.53	14.72	29.47	14.85	33
34	30.56	14.90	30.49	15.04	30.43	15.17	30.36	15.30	34
35	31.46	15.34	31.39	15.48	31.32	15.62	31.25	15.75	35
36	32.36	15.78	32.29	15.92	32.22	16.06	32.15	16.20	36
37	33.26	16.22	33.18	16.36	33.11	16.51	33.04	16.65	37
38	34.15	16.66	34.08	16.81	34.01	16.96	33.93	17.10	38
39	35.05	17.10	34.98	17.25	34.90	17.40	34.83	17.55	39
40	35.95	17.53	35.87	17.69	35.80	17.85	35.72	18.00	40
41	36.85	17.97	36.77	18.13	36.69	18.29	36.61	18.45	41
42	37.75	18.41	37.67	18.58	37.59	18.74	37.51	18.90	42
43	38.65	18.85	38.57	19.02	38.48	19.19	38.40	19.35	43
44	39.55	19.29	39.46	19.46	39.38	19.63	39.29	19.80	44
45	40.45	19.73	40.36	19.90	40.27	20.08	40.18	20.25	45
46	41.34	20.17	41.26	20.35	41.17	20.53	41.08	20.70	46
47	42.24	20.60	42.15	20.79	42.06	20.97	41.97	21.15	47
48	43.14	21.04	43.05	21.23	42.96	21.42	42.86	21.60	48
49	44.04	21.48	43.95	21.67	43.85	21.86	43.76	22.05	49
50	44.94	21.92	44.84	22.11	44.75	22.31	44.65	22.50	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	64 Deg.		63¾ Deg.		62½ Deg.		63¼ Deg.		

Dist.	26 Deg. Lat.	Dep.	26¼ Deg. Lat.	Dep.	26½ Deg. Lat.	Dep.	26¾ Deg Lat.	Dep.	Dist.
51	45.84	22.36	45.74	22.56	45.64	22.76	45.54	22.96	51
52	46.74	22.80	46.64	23.00	46.54	23.20	46.43	23.41	52
53	47.64	23.23	47.53	23.44	47.43	23.65	47.33	23.86	53
54	48.53	23.67	48.43	23.88	48.33	24.09	48.22	24.31	54
55	49.43	24.11	49.33	24.33	49.22	24.54	49.11	24.76	55
56	50.33	24.55	50.22	24.77	50.12	24.99	50.01	25.21	56
57	51.23	24.99	51.12	25.21	51.01	25.43	50.90	25.66	57
58	52.13	25.43	52.02	25.65	51.91	25.88	51.79	26.11	58
59	53.03	25.86	52.92	26.09	52.80	26.33	52.69	26.56	59
60	53.93	26.30	53.81	26.54	53.70	26.77	53.58	27.01	60
61	54.83	26.74	54.71	26.98	54.59	27.22	54.47	27.46	61
62	55.73	27.18	55.61	27.42	55.49	27.66	55.36	27.91	62
63	56.62	27.62	56.50	27.86	56.38	28.11	56.26	28.36	63
64	57.52	28.06	57.40	28.31	57.28	28.56	57.15	28.81	64
65	58.42	28.49	58.30	28.75	58.17	29.00	58.04	29.26	65
66	59.32	28.93	59.19	29.19	59.07	29.45	58.94	29.71	66
67	60.22	29.37	60.09	29.63	59.96	29.90	59.83	30.16	67
68	61.12	29.81	60.99	30.08	60.86	30.34	60.72	30.61	68
69	62.02	30.25	61.88	30.52	61.75	30.79	61.62	31.06	69
70	62.92	30.69	62.78	30.96	62.65	31.23	62.51	31.51	70
71	63.81	31.12	63.68	31.40	63.54	31.68	63.40	31.96	71
72	64.71	31.56	64.57	31.84	64.44	32.13	64.29	32.41	72
73	65.61	32.00	65.47	32.29	65.33	32.57	65.19	32.86	73
74	66.51	32.44	66.37	32.73	66.23	33.02	66.08	33.31	74
75	67.41	32.88	67.27	33.17	67.12	33.46	66.97	33.76	75
76	68.31	33.32	68.16	33.61	68.01	33.91	67.87	34.21	76
77	69.21	33.75	69.06	34.06	68.91	34.36	68.76	34.66	77
78	70.11	34.19	69.96	34.50	69.80	34.80	69.65	35.11	78
79	71.00	34.63	70.85	34.94	70.70	35.25	70.55	35.56	79
80	71.90	35.07	71.75	35.38	71.59	35.70	71.44	36.01	80
81	72.80	35.51	72.65	35.83	72.49	36.14	72.33	36.46	81
82	73.70	35.95	73.54	36.27	73.38	36.59	73.22	36.91	82
83	74.60	36.38	74.44	36.71	74.28	37.03	74.12	37.36	83
84	75.50	36.82	75.34	37.15	75.17	37.48	75.01	37.81	84
85	76.40	37.26	76.23	37.59	76.07	37.93	75.90	38.26	85
86	77.30	37.70	77.13	38.04	76.96	38.37	76.80	38.71	86
87	78.20	38.14	78.03	38.48	77.86	38.82	77.69	39.16	87
88	79.09	38.58	78.92	38.92	78.75	39.27	78.58	39.61	88
89	79.99	39.01	79.82	39.36	79.65	39.71	79.48	40.06	89
90	80.89	39.45	80.72	39.81	80.54	40.16	80.37	40.51	90
91	81.79	39.89	81.62	40.25	81.44	40.60	81.26	40.96	91
92	82.69	40.33	82.51	40.69	82.33	41.05	82.15	41.41	92
93	83.59	40.77	83.41	41.13	83.23	41.50	83.05	41.86	93
94	84.49	41.21	84.31	41.58	84.12	41.94	83.94	42.31	94
95	85.39	41.65	85.20	42.02	85.02	42.39	84.83	42.76	95
96	86.28	42.08	86.10	42.46	85.91	42.83	85.73	43.21	96
97	87.18	42.52	87.00	42.90	86.81	43.28	86.62	43.66	97
98	88.08	42.96	87.89	43.34	87.70	43.73	87.51	44.11	98
99	88.98	43.40	88.79	43.79	88.60	44.17	88.40	44.56	99
100	89.88	43.84	89.69	44.23	89.49	44.62	89.30	45.01	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	64 Deg.		63¾ Deg.		63½ Deg.		63¼ Deg		

Dist.	27 Deg. Lat.	Dep.	27¼ Deg. Lat.	Dep.	27½ Deg. Lat.	Dep.	27¾ Deg. Lat.	Dep.	Dist.
1	0.89	0.45	0.89	0.46	0.89	0.46	0.88	0.47	1
2	1.78	0.91	1.78	0.92	1.77	0.92	1.77	0.93	2
3	2.67	1.36	2.67	1.37	2.66	1.39	2.65	1.40	3
4	3.56	1.82	3.56	1.83	3.55	1.85	3.54	1.86	4
5	4.45	2.27	4.45	2.29	4.44	2.31	4.42	2.33	5
6	5.35	2.72	5.33	2.75	5.32	2.77	5.31	2.79	6
7	6.24	3.18	6.22	3.21	6.21	3.23	6.19	3.26	7
8	7.13	3.63	7.11	3.66	7.10	3.69	7.08	3.72	8
9	8.02	4.09	8.00	4.12	7.98	4.16	7.96	4.19	9
10	8.91	4.54	8.89	4.58	8.87	4.62	8.85	4.66	10
11	9.80	4.99	9.78	5.04	9.76	5.08	9.73	5.12	11
12	10.69	5.45	10.67	5.49	10.64	5.54	10.62	5.59	12
13	11.58	5.90	11.56	5.95	11.53	6.00	11.50	6.05	13
14	12.47	6.36	12.45	6.41	12.42	6.46	12.39	6.52	14
15	13.37	6.81	13.34	6.87	13.31	6.93	13.27	6.98	15
16	14.26	7.26	14.22	7.33	14.19	7.39	14.16	7.45	16
17	15.15	7.72	15.11	7.78	15.08	7.85	15.04	7.92	17
18	16.04	8.17	16.00	8.24	15.97	8.31	15.93	8.38	18
19	16.93	8.63	16.89	8.70	16.85	8.77	16.81	8.85	19
20	17.82	9.08	17.78	9.16	17.74	9.24	17.70	9.31	20
21	18.71	9.53	18.67	9.62	18.63	9.70	18.58	9.78	21
22	19.60	9.99	19.56	10.07	19.51	10.16	19.47	10.24	22
23	20.49	10.44	20.45	10.53	20.40	10.62	20.35	10.71	23
24	21.38	10.90	21.34	10.99	21.29	11.08	21.24	11.17	24
25	22.28	11.35	22.23	11.45	22.18	11.54	22.12	11.64	25
26	23.17	11.80	23.11	11.90	23.06	12.01	23.01	12.11	26
27	24.06	12.26	24.00	12.36	23.95	12.47	23.89	12.57	27
28	24.95	12.71	24.89	12.82	24.84	12.93	24.78	13.04	28
29	25.84	13.17	25.78	13.28	25.72	13.39	25.66	13.50	29
30	26.73	13.62	26.67	13.74	26.61	13.85	26.55	13.97	30
31	27.62	14.02	27.56	14.19	27.50	14.31	27.43	14.43	31
32	28.51	14.53	28.45	14.65	28.38	14.78	28.32	14.90	32
33	29.40	14.88	29.34	15.11	29.27	15.24	29.20	15.37	33
34	30.16	15.44	30.23	15.57	30.16	15.70	30.09	15.83	34
35	31.19	15.89	31.13	16.03	31.05	16.16	30.97	16.30	35
36	32.08	16.34	32.00	16.48	31.93	16.62	31.86	16.76	36
37	32.97	16.80	32.88	16.94	32.82	17.08	32.74	17.23	37
38	33.86	17.25	33.78	17.40	33.71	17.55	33.63	17.69	38
39	34.75	17.71	34.67	17.86	34.59	18.01	34.51	18.16	39
40	35.64	18.16	35.56	18.31	35.48	18.47	35.40	18.62	40
41	36.53	18.61	36.45	18.77	36.37	18.93	36.28	19.09	41
42	37.42	19.07	37.34	19.23	37.25	19.39	37.17	19.56	42
43	38.31	19.52	38.23	19.69	38.14	19.86	38.05	20.02	43
44	39.20	19.98	39.12	20.15	39.03	20.32	38.94	20.49	44
45	40.10	20.43	40.01	20.60	39.92	20.78	39.82	20.95	45
46	40.99	20.88	40.89	21.06	40.80	21.24	40.71	21.42	46
47	41.88	21.34	41.78	21.52	41.69	21.70	41.59	21.88	47
48	42.77	21.79	42.67	21.98	42.58	22.16	42.48	22.35	48
49	43.66	22.25	43.56	22.44	43.46	22.63	43.36	22.82	49
50	44.55	22.70	44.45	22.89	44.35	23.09	44.25	23.28	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	63 Deg.		62¾ Deg.		62½ Deg.		62¼ Deg.		

Dist.	27 Deg. Lat.	Dep.	27¼ Deg. Lat.	Dep.	27½ Deg. Lat.	Dep	27¾ Deg. Lat.	Dep.	Dist.
51	45.44	23.15	45.34	23.35	45.24	23.55	45.13	23.75	51
52	46.33	23.61	46.23	23.81	46.12	24.01	46.02	24.21	52
53	47.22	24.06	47.12	24.27	47.01	24.47	46.90	24.68	53
54	48.11	24.52	48.01	24.73	47.90	24.93	47.79	25.14	54
55	49.01	24.97	48.90	25.18	48.79	25.40	48.67	25.61	55
56	49.90	25.42	49.78	25.64	49.67	25.86	49.56	26.07	56
57	50.79	25.88	50.67	26.10	50.56	26.32	50.44	26.54	57
58	51.68	26.33	51.56	26.56	51.45	26.78	51.33	27.01	58
59	52.57	26.79	52.45	27.01	52.33	27.24	52.21	27.47	59
60	53.46	27.24	53.34	27.47	53.22	27.70	53.10	27.94	60
61	54.35	27.69	54.23	27.93	54.11	28.17	53.98	28.40	61
62	55.24	28.15	55.12	28.39	54.99	28.63	54.87	28.87	62
63	56.13	28.60	56.01	28.85	55.88	29.09	55.75	29.33	63
64	57.02	29.06	56.90	29.30	56.77	29.55	56.64	29.80	64
65	57.92	29.51	57.79	29.76	57.66	30.01	57.52	30.26	65
66	58.81	29.96	58.68	30.22	58.54	30.48	58.41	30.73	66
67	59.70	30.42	59.56	30.68	59.43	30.94	59.29	31.20	67
68	60.59	30.87	60.45	31.14	60.32	31.40	60.18	31.66	68
69	61.48	31.33	61.34	31.59	61.20	31.86	61.06	32.13	69
70	62.37	31.78	62.23	32.05	62.09	32.32	61.95	32.59	70
71	63.26	32.23	63.12	32.51	62.98	32.78	62.83	33.06	71
72	64.15	32.69	64.01	32.97	63.86	33.25	63.72	33.52	72
73	65.04	33.14	64.90	33.42	64.75	33.71	64.60	33.99	73
74	65.93	33.60	65.79	33.88	65.64	34.17	65.49	34.46	74
75	66.83	34.05	66.68	34.34	66.53	34.63	66.37	34.92	75
76	67.72	34.50	67.57	34.80	67.41	35.09	67.26	35.39	76
77	68.61	34.96	68.45	35.26	68.30	35.55	68.14	35.85	77
78	69.50	35.41	69.34	35.71	69.19	36.02	69.03	36.32	78
79	70.39	35.87	70.23	36.17	70.07	36.48	69.91	36.78	79
80	71.28	36.32	71.12	36.63	70.96	36.94	70.80	37.25	80
81	72.17	36.77	72.01	37.09	71.85	37.40	71.68	37.71	81
82	73.06	37.23	72.90	37.55	72.73	37.86	72.57	38.18	82
83	73.95	37.68	73.79	38.00	73.62	38.33	73.45	38.65	83
84	74.84	38.14	74.68	38.46	74.51	38.79	74.34	39.11	84
85	75.74	38.59	75.57	38.92	75.40	39.25	75.22	39.58	85
86	76.63	39.04	76.46	39.38	76.28	39.71	76.11	40.04	86
87	77.52	39.50	77.34	39.84	77.17	40.17	76.99	40.51	87
88	78.41	39.95	78.23	40.29	78.06	40.63	77.88	40.97	88
89	79.30	40.41	79.12	40.75	78.94	41.10	78.76	41.44	89
90	80.19	40.86	80.01	41.21	79.83	41.56	79.65	41.91	90
91	81.08	41.31	80.90	41.67	80.72	42.02	80.53	42.37	91
92	81.97	41.77	81.79	42.12	81.60	42.48	81.42	42.84	92
93	82.86	42.22	82.68	42.58	82.49	42.94	82.30	43.30	93
94	83.75	42.68	83.57	43.04	83.38	43.40	83.19	43.77	94
95	84.65	43.13	84.46	43.50	84.27	43.87	84.07	44.23	95
96	85.54	43.58	85.35	43.96	85.15	44.33	84.96	44.70	96
97	86.43	44.04	86.23	44.41	86.04	44.79	85.84	45.16	97
98	87.32	44.49	87.12	44.87	86.93	45.25	86.73	45.63	98
99	88.21	44.95	88.01	45.33	87.81	45.71	87.61	46.10	99
100	89.10	45.40	88.90	45.79	88.70	46.17	88.50	46.56	100
Dist.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	63 Deg.		62¾ Deg.		62½ Deg.		62¼ Deg.		

Dist.	30 Deg.		30¼ Deg.		30½ Deg.		30¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.87	0.50	0.86	0.50	0.86	0.51	0.86	0.51	1
2	1.73	1.00	1.73	1.01	1.72	1.02	1.72	1.02	2
3	2.60	1.50	2.59	1.51	2.58	1.52	2.58	1.53	3
4	3.46	2.00	3.46	2.02	3.45	2.03	3.44	2.05	4
5	4.33	2.50	4.32	2.52	4.31	2.54	4.30	2.56	5
6	5.20	3.00	5.18	3.02	5.17	3.05	5.16	3.07	6
7	6.06	3.50	6.05	3.53	6.03	3.55	6.02	3.58	7
8	6.93	4.00	6.91	4.03	6.89	4.06	6.88	4.09	8
9	7.79	4.50	7.77	4.53	7.75	4.57	7.73	4.60	9
10	8.66	5.00	8.64	5.04	8.62	5.08	8.59	5.11	10
11	9.53	5.50	9.50	5.54	9.48	5.58	9.45	5.62	11
12	10.39	6.00	10.37	6.05	10.34	6.09	10.31	6.14	12
13	11.26	6.50	11.23	6.55	11.20	6.60	11.17	6.65	13
14	12.12	7.00	12.09	7.05	12.06	7.11	12.03	7.16	14
15	12.99	7.50	12.96	7.56	12.92	7.61	12.89	7.67	15
16	13.86	8.00	13.82	8.06	13.79	8.12	13.75	8.18	16
17	14.72	8.50	14.69	8.56	14.65	8.63	14.61	8.69	17
18	15.59	9.00	15.55	9.07	15.51	9.14	15.47	9.20	18
19	16.45	9.50	16.41	9.57	16.37	9.64	16.33	9.71	19
20	17.32	10.00	17.28	10.08	17.23	10.15	17.19	10.23	20
21	18.19	10.50	18.14	10.58	18.09	10.66	18.05	10.74	21
22	19.05	11.00	19.00	11.08	18.96	11.17	18.91	11.25	22
23	19.92	11.50	19.87	11.59	19.82	11.67	19.77	11.76	23
24	20.78	12.00	20.73	12.09	20.68	12.18	20.63	12.27	24
25	21.65	12.50	21.60	12.59	21.54	12.69	21.49	12.78	25
26	22.52	13.00	22.46	13.10	22.40	13.20	22.34	13.29	26
27	23.38	13.50	23.32	13.60	23.26	13.70	23.20	13.80	27
28	24.25	14.00	24.19	14.11	24.13	14.21	24.06	14.32	28
29	25.11	14.50	25.05	14.61	24.99	14.72	24.92	14.83	29
30	25.98	15.00	25.92	15.11	25.85	15.23	25.78	15.34	30
31	26.85	15.50	26.78	15.62	26.71	15.73	26.64	15.85	31
32	27.71	16.00	27.64	16.12	27.57	16.24	27.50	16.36	32
33	28.58	16.50	28.51	16.62	28.43	16.75	28.36	16.87	33
34	29.44	17.00	29.37	17.13	29.30	17.26	29.22	17.38	34
35	30.31	17.50	30.23	17.63	30.16	17.76	30.08	17.90	35
36	31.18	18.00	31.10	18.14	31.02	18.27	30.94	18.41	36
37	32.04	18.50	31.96	18.64	31.88	18.78	31.80	18.92	37
38	32.91	19.00	32.83	19.14	32.74	19.29	32.66	19.43	38
39	33.77	19.50	33.69	19.65	33.60	19.79	33.52	19.94	39
40	34.64	20.00	34.55	20.15	34.47	20.30	34.38	20.45	40
41	35.51	20.50	35.42	20.65	35.33	20.81	35.24	20.96	41
42	36.37	21.00	36.28	21.16	36.19	21.32	36.10	21.47	42
43	37.24	21.50	37.14	21.66	37.05	21.82	36.95	21.99	43
44	38.11	22.00	38.01	22.17	37.91	22.33	37.81	22.50	44
45	38.97	22.50	38.87	22.67	38.77	22.84	38.67	23.01	45
46	39.84	23.00	39.74	23.17	39.63	23.35	39.53	23.52	46
47	40.70	23.50	40.60	23.68	40.50	23.85	40.39	24.03	47
48	41.57	24.00	41.46	24.18	41.36	24.36	41.25	24.54	48
49	42.44	24.50	42.33	24.68	42.22	24.87	42.11	25.05	49
50	43.30	25.00	43.19	25.19	43.08	25.38	42.97	25.56	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	60 Deg.		59¾ Deg.		59½ Deg.		59¼ Deg.		

Dist.	28 Deg. Lat.	Dep.	28¼ Deg. Lat.	Dep.	28½ Deg. Lat.	Dep.	28¾ Deg. Lat.	Dep.	Dist.
51	45.03	23.94	44.93	24.14	44.82	24.34	44.71	24.53	51
52	45.91	24.41	45.81	24.61	45.70	24.81	45.59	25.01	52
53	46.80	24.88	46.69	25.09	46.58	25.29	46.47	25.49	53
54	47.68	25.35	47.57	25.56	47.46	25.77	47.34	25.97	54
55	48.56	25.82	48.45	26.03	48.33	26.24	48.22	26.45	55
56	49.45	26.29	49.33	26.51	49.21	26.72	49.10	26.94	56
57	50.33	26.76	50.21	26.98	50.09	27.20	49.97	27.42	57
58	51.21	27.23	51.09	27.45	50.97	27.68	50.85	27.90	58
59	52.09	27.70	51.97	27.93	51.85	28.15	51.73	28.38	59
60	52.98	28.17	52.85	28.40	52.73	28.63	52.60	28.86	60
61	53.86	28.64	53.73	28.87	53.61	29.11	53.48	29.34	61
62	54.74	29.11	54.62	29.35	54.49	29.58	54.36	29.82	62
63	55.63	29.58	55.50	29.82	55.37	30.06	55.23	30.30	63
64	56.51	30.05	56.38	30.29	56.24	30.54	56.11	30.78	64
65	57.39	30.52	57.26	30.77	57.12	31.02	56.99	31.26	65
66	58.27	30.99	58.14	31.24	58.00	31.49	57.86	31.75	66
67	59.16	31.45	59.02	31.71	58.88	31.97	58.74	32.23	67
68	60.04	31.92	59.90	32.19	59.76	32.45	59.62	32.71	68
69	60.92	32.39	60.78	32.66	60.64	32.92	60.49	33.19	69
70	61.81	32.86	61.66	33.13	61.52	33.40	61.37	33.67	70
71	62.69	33.33	62.54	33.61	62.40	33.88	62.25	34.15	71
72	63.57	33.80	63.42	34.08	63.27	34.36	63.12	34.63	72
73	64.46	34.27	64.30	34.55	64.15	34.83	64.00	35.11	73
74	65.34	34.74	65.19	35.03	65.03	35.31	64.88	35.59	74
75	66.22	35.21	66.07	35.50	65.91	35.79	65.75	36.07	75
76	67.10	35.68	66.95	35.97	66.79	36.26	66.63	36.56	76
77	67.99	36.15	67.83	36.45	67.67	36.74	67.51	37.04	77
78	68.87	36.62	68.71	36.92	68.55	37.22	68.38	37.52	78
79	69.75	37.09	69.59	37.39	69.43	37.70	69.26	38.00	79
80	70.64	37.56	70.47	37.87	70.31	38.17	70.14	38.48	80
81	71.52	38.03	71.35	38.34	71.18	38.65	71.01	38.96	81
82	72.40	38.50	72.23	38.81	72.06	39.13	71.89	39.44	82
83	73.28	38.97	73.11	39.29	72.94	39.60	72.77	39.92	83
84	74.17	39.44	73.99	39.76	73.82	40.08	73.64	40.40	84
85	75.05	39.91	74.88	40.23	74.70	40.56	74.52	40.88	85
86	75.93	40.37	75.76	40.71	75.58	41.04	75.40	41.36	86
87	76.82	40.84	76.64	41.18	76.46	41.51	76.28	41.85	87
88	77.70	41.31	77.52	41.65	77.34	41.99	77.15	42.33	88
89	78.58	41.78	78.40	42.13	78.21	42.47	78.03	42.81	89
90	79.47	42.25	79.28	42.60	79.09	42.94	78.91	43.29	90
91	80.35	42.72	80.16	43.07	79.97	43.42	79.78	43.77	91
92	81.23	43.19	81.04	43.55	80.85	43.90	80.66	44.25	92
93	82.11	43.66	81.92	44.02	81.73	44.38	81.54	44.73	93
94	83.00	44.13	82.80	44.49	82.61	44.85	82.41	45.21	94
95	83.88	44.60	83.68	44.97	83.49	45.33	83.29	45.69	95
96	84.76	45.07	84.57	45.44	84.37	45.81	84.17	46.17	96
97	85.65	45.54	85.45	45.91	85.25	46.28	85.04	46.66	97
98	86.53	46.01	86.33	46.39	86.12	46.76	85.92	47.14	98
99	87.41	46.48	87.21	46.86	87.00	47.24	86.80	47.62	99
100	88.29	46.95	88.09	47.33	87.88	47.72	87.67	48.10	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	62 Deg.		61¾ Deg.		61½ Deg.		61¼ Deg.		

1 H

Dist.	34 Deg.		34¼ Deg.		34½ Deg.		34¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.83	0.56	0.83	0.56	0.82	0.57	0.82	0.57	1
2	1.66	1.12	1.65	1.13	1.65	1.13	1.64	1.14	2
3	2.49	1.68	2.48	1.69	2.47	1.70	2.46	1.71	3
4	3.32	2.24	3.31	2.25	3.30	2.27	3.29	2.28	4
5	4.15	2.80	4.13	2.81	4.12	2.83	4.11	2.85	5
6	4.97	3.36	4.96	3.38	4.94	3.40	4.93	3.42	6
7	5.80	3.91	5.79	3.94	5.77	3.96	5.75	3.99	7
8	6.63	4.47	6.61	4.50	6.59	4.53	6.57	4.56	8
9	7.40	5.03	7.44	5.07	7.42	5.10	7.39	5.13	9
10	8.29	5.59	8.27	5.63	8.24	5.66	8.22	5.70	10
11	9.12	6.15	9.09	6.19	9.07	6.23	9.04	6.27	11
12	9.95	6.71	9.92	6.75	9.89	6.80	9.86	6.84	12
13	10.78	7.27	10.75	7.32	10.71	7.36	10.68	7.41	13
14	11.61	7.83	11.57	7.88	11.54	7.93	11.50	7.98	14
15	12.44	8.39	12.40	8.44	12.36	8.50	12.32	8.55	15
16	13.26	8.95	13.23	9.00	13.19	9.06	13.15	9.12	16
17	14.09	9.51	14.05	9.57	14.01	9.63	13.97	9.69	17
18	14.92	10.07	14.88	10.13	14.83	10.20	14.79	10.26	18
19	15.75	10.62	15.71	10.69	15.66	10.76	15.61	10.83	19
20	16.58	11.18	16.53	11.26	16.48	11.33	16.43	11.40	20
21	17.41	11.74	17.36	11.82	17.31	11.89	17.25	11.97	21
22	18.24	12.30	18.18	12.38	18.13	12.46	18.08	12.54	22
23	19.07	12.86	19.01	12.94	18.95	13.03	18.90	13.11	23
24	19.90	13.42	19.84	13.51	19.78	13.59	19.72	13.68	24
25	20.73	13.98	20.66	14.07	20.60	14.16	20.54	14.25	25
26	21.55	14.54	21.49	14.63	21.43	14.73	21.36	14.82	26
27	22.38	15.10	22.32	15.20	22.25	15.29	22.18	15.39	27
28	23.21	15.66	23.14	15.76	23.08	15.86	23.01	15.96	28
29	24.04	16.22	23.97	16.32	23.90	16.43	23.83	16.53	29
30	24.87	16.78	24.80	16.88	24.72	16.99	24.65	17.10	30
31	25.70	17.33	25.62	17.45	25.55	17.56	25.47	17.67	31
32	26.53	17.89	26.45	18.01	26.37	18.12	26.29	18.24	32
33	27.36	18.45	27.28	18.57	27.20	18.69	27.11	18.81	33
34	28.19	19.01	28.10	19.14	28.02	19.26	27.94	19.38	34
35	29.02	19.57	28.93	19.70	28.84	19.82	28.76	19.95	35
36	29.85	20.13	29.76	20.26	29.67	20.39	29.58	20.52	36
37	30.67	20.69	30.58	20.82	30.49	20.96	30.40	21.09	37
38	31.50	21.25	31.41	21.39	31.32	21.52	31.22	21.66	38
39	32.33	21.81	32.24	21.95	32.14	22.09	32.04	22.23	39
40	33.16	22.37	33.06	22.51	32.97	22.66	32.87	22.80	40
41	33.99	22.93	33.89	23.07	33.79	23.22	33.69	23.37	41
42	34.82	23.49	34.72	23.64	34.61	23.79	34.51	23.94	42
43	35.65	24.05	35.54	24.20	35.44	24.36	35.33	24.51	43
44	36.48	24.60	36.37	24.76	36.26	24.92	36.15	25.08	44
45	37.31	25.16	37.20	25.33	37.09	25.49	36.97	25.65	45
46	38.14	25.72	38.02	25.89	37.91	26.05	37.80	26.22	46
47	38.96	26.28	38.85	26.45	38.73	26.62	38.62	26.79	47
48	39.79	26.84	39.68	27.01	39.56	27.19	39.44	27.36	48
49	40.62	27.40	40.50	27.58	40.38	27.75	40.26	27.93	49
50	41.45	27.96	41.33	28.14	41.21	28.32	41.08	28.50	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	56 Deg.		55¾ Deg.		55½ Deg.		55¼ Deg.		

Dist.	29 Deg. Lat.	Dep.	29¼ Deg. Lat.	Dep.	29½ Deg. Lat.	Dep	29¾ Deg. Lat.	Dep.	Dist.
51	44.61	24.73	44.50	24.92	44.39	25.11	44.28	25.31	51
52	45.48	25.21	45.37	25.41	45.26	25.61	45.15	25.80	52
53	46.35	25.69	46.24	25.90	46.13	26.10	46.01	26.30	53
54	47.23	26.18	47.11	26.39	47.00	26.59	46.88	26.80	54
55	48.10	26.66	47.99	26.87	47.87	27.08	47.75	27.29	55
56	48.98	27.15	48.86	27.36	48.74	27.58	48.62	27.79	56
57	49.85	27.63	49.73	27.85	49.61	28.07	49.49	28.28	57
58	50.73	28.12	50.60	28.34	50.48	28.56	50.36	28.78	58
59	51.60	28.60	51.48	28.83	51.35	29.05	51.22	29.28	59
60	52.48	29.09	52.35	29.32	52.22	29.55	52.09	29.77	60
61	53.35	29.57	53.22	29.81	53.09	30.04	52.96	30.27	61
62	54.23	30.06	54.09	30.29	53.96	30.53	53.83	30.77	62
63	55.10	30.54	54.97	30.78	54.83	31.02	54.70	31.26	63
64	55.98	31.03	55.84	31.27	55.70	31.52	55.56	31.76	64
65	56.85	31.51	56.71	31.76	56.57	32.01	56.43	32.25	65
66	57.72	32.00	57.58	32.25	57.44	32.50	57.30	32.75	66
67	58.60	32.48	58.46	32.74	58.31	32.99	58.17	33.25	67
68	59.47	32.97	59.33	33.23	59.18	33.48	59.04	33.74	68
69	60.35	33.45	60.20	33.71	60.05	33.98	59.91	34.24	69
70	61.22	33.94	61.07	34.20	60.92	34.47	60.77	34.74	70
71	62.10	34.42	61.95	34.69	61.80	34.96	61.64	35.23	71
72	62.97	34.91	62.82	35.18	62.67	35.45	62.51	35.73	72
73	63.85	35.39	63.69	35.67	63.54	35.95	63.38	36.22	73
74	64.72	35.88	64.56	36.16	64.41	36.44	64.25	36.72	74
75	65.60	36.36	65.44	36.65	65.28	36.93	65.11	37.22	75
76	66.47	36.85	66.31	37.14	66.15	37.42	65.98	37.71	76
77	67.35	37.33	67.18	37.62	67.02	37.92	66.85	38.21	77
78	68.22	37.82	68.05	38.11	67.89	38.41	67.72	38.70	78
79	69.09	38.30	68.93	38.60	68.76	38.90	68.59	39.20	79
80	69.97	38.78	69.80	39.09	69.63	39.39	69.46	39.70	80
81	70.84	39.27	70.67	39.58	70.50	39.89	70.32	40.19	81
82	71.72	39.75	71.54	40.07	71.37	40.38	71.19	40.69	82
83	72.59	40.24	72.42	40.56	72.24	40.87	72.06	41.19	83
84	73.47	40.72	73.29	41.04	73.11	41.36	72.93	41.68	84
85	74.34	41.21	74.16	41.53	73.98	41.86	73.80	42.18	85
86	75.22	41.69	75.03	42.02	74.85	42.35	74.67	42.67	86
87	76.09	42.18	75.91	42.51	75.72	42.84	75.53	43.17	87
88	76.97	42.66	76.78	43.00	76.59	43.33	76.40	43.67	88
89	77.84	43.15	77.65	43.49	77.46	43.83	77.27	44.16	89
90	78.72	43.63	78.52	43.98	78.33	44.32	78.14	44.66	90
91	79.59	44.12	79.40	44.46	79.20	44.81	79.01	45.16	91
92	80.46	44.60	80.27	44.95	80.07	45.30	79.87	45.65	92
93	81.34	45.09	81.14	45.44	80.94	45.80	80.74	46.15	93
94	82.21	45.57	82.01	45.93	81.81	46.29	81.61	46.64	94
95	83.09	46.06	82.89	46.42	82.68	46.78	82.48	47.14	95
96	83.96	46.54	83.76	46.91	83.55	47.27	83.35	47.64	96
97	84.84	47.03	84.63	47.40	84.42	47.77	84.22	48.13	97
98	85.71	47.51	85.50	47.88	85.29	48.26	85.08	48.63	98
99	86.59	48.00	86.38	48.37	86.17	48.75	85.95	49.13	99
100	87.46	48.48	87.25	48.86	87.04	49.24	86.82	49.62	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	61 Deg.		60¾ Deg		60½ Deg.		60¼ Deg		

Dist	55 Deg. Lat.	Dep.	35½ Deg. Lat.	Dep.	35½ Deg. Lat.	Dep.	35¾ Deg. Lat.	Dep.	Dist
1	0.82	0.57	0.82	0.58	0.81	0.58	0.81	0.58	1
2	1.64	1.15	1.63	1.15	1.63	1.16	1.62	1.17	2
3	2.46	1.72	2.45	1.73	2.44	1.74	2.43	1.75	3
4	3.28	2.29	3.27	2.31	3.26	2.32	3.25	2.34	4
5	4.10	2.87	4.08	2.89	4.07	2.90	4.06	2.92	5
6	4.91	3.44	4.90	3.46	4.88	3.48	4.87	3.51	6
7	5.73	4.01	5.72	4.04	5.70	4.06	5.68	4.09	7
8	6.55	4.59	6.53	4.62	6.51	4.65	6.49	4.67	8
9	7.37	5.16	7.35	5.19	7.33	5.23	7.30	5.26	9
10	8.19	5.74	8.17	5.77	8.14	5.81	8.12	5.84	10
11	9.01	6.31	8.98	6.35	8.96	6.39	8.93	6.43	11
12	9.83	6.88	9.80	6.93	9.77	6.97	9.74	7.01	12
13	10.65	7.46	10.62	7.50	10.58	7.55	10.55	7.60	13
14	11.47	8.03	11.43	8.08	11.40	8.13	11.36	8.18	14
15	12.29	8.60	12.25	8.66	12.21	8.71	12.17	8.76	15
16	13.11	9.18	13.07	9.23	13.03	9.29	12.99	9.35	16
17	13.93	9.75	13.88	9.81	13.84	9.87	13.80	9.93	17
18	14.74	10.32	14.70	10.39	14.65	10.45	14.61	10.52	18
19	15.56	10.90	15.52	10.97	15.47	11.03	15.42	11.10	19
20	16.38	11.47	16.33	11.54	16.28	11.61	16.23	11.68	20
21	17.20	12.05	17.15	12.12	17.10	12.19	17.04	12.27	21
22	18.02	12.62	17.97	12.70	17.91	12.78	17.85	12.85	22
23	18.84	13.19	18.78	13.27	18.72	13.36	18.67	13.44	23
24	19.66	13.77	19.60	13.85	19.54	13.94	19.48	14.02	24
25	20.48	14.34	20.42	14.43	20.35	14.52	20.29	14.61	25
26	21.30	14.91	21.23	15.01	21.17	15.10	21.10	15.19	26
27	22.12	15.49	22.05	15.58	21.98	15.68	21.91	15.77	27
28	22.94	16.06	22.87	16.16	22.80	16.26	22.72	16.36	28
29	23.76	16.63	23.68	16.74	23.61	16.84	23.54	16.94	29
30	24.57	17.21	24.50	17.31	24.42	17.42	24.35	17.53	30
31	25.39	17.78	25.32	17.89	25.24	18.00	25.16	18.11	31
32	26.21	18.35	26.13	18.47	26.05	18.58	25.97	18.70	32
33	27.03	18.93	26.95	19.05	26.87	19.16	26.78	19.28	33
34	27.85	19.50	27.77	19.62	27.68	19.74	27.59	19.86	34
35	28.67	20.08	28.58	20.20	28.49	20.32	28.41	20.45	35
36	29.49	20.65	29.40	20.78	29.31	20.91	29.22	21.03	36
37	30.31	21.22	30.22	21.35	30.12	21.49	30.03	21.62	37
38	31.13	21.80	31.03	21.93	30.94	22.07	30.84	22.20	38
39	31.95	22.37	31.85	22.51	31.75	22.65	31.65	22.79	39
40	32.77	22.94	32.67	23.09	32.56	23.23	32.46	23.37	40
41	33.59	23.52	33.48	23.66	33.38	23.81	33.27	23.95	41
42	34.40	24.09	34.30	24.24	34.19	24.39	34.09	24.54	42
43	35.22	24.66	35.12	24.82	35.01	24.97	34.90	25.12	43
44	36.04	25.24	35.93	25.39	35.82	25.55	35.71	25.71	44
45	36.86	25.81	36.75	25.97	36.64	26.13	36.52	26.29	45
46	37.68	26.38	37.57	26.55	37.45	26.71	37.33	26.88	46
47	38.50	26.96	38.38	27.13	38.26	27.29	38.14	27.46	47
48	39.32	27.53	39.20	27.70	39.08	27.87	38.96	28.04	48
49	40.14	28.11	40.02	28.28	39.89	28.45	39.77	28.63	49
50	40.96	28.68	40.83	28.86	40.71	29.04	40.58	29.21	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	55 Deg.		54¾ Deg.		54½ Deg.		54¼ Deg.		

Dist.	35 Deg. Lat.	Dep.	35¼ Deg. Lat.	Dep.	35½ Deg. Lat.	Dep.	35¾ Deg. Lat.	Dep.	Dist.
51	41.78	29.25	41.65	29.43	41.52	29.62	41.39	29.80	51
52	42.60	29.83	42.47	30.01	42.33	30.20	42.20	30.38	52
53	43.42	30.40	43.28	30.59	43.15	30.78	43.01	30.97	53
54	44.23	30.97	44.10	31.17	43.96	31.36	43.82	31.55	54
55	45.05	31.55	44.92	31.74	44.78	31.94	44.64	32.13	55
56	45.87	32.12	45.73	32.32	45.59	32.52	45.45	32.72	56
57	46.69	32.69	46.55	32.90	46.40	33.10	46.26	33.30	57
58	47.51	33.27	47.37	33.47	47.22	33.68	47.07	33.89	58
59	48.33	33.84	48.18	34.05	48.03	34.26	47.88	34.47	59
60	49.15	34.41	49.00	34.63	48.85	34.84	48.69	35.05	60
61	49.97	34.99	49.82	35.21	49.66	35.42	49.51	35.64	61
62	50.79	35.56	50.63	35.78	50.48	36.00	50.32	36.22	62
63	51.61	36.14	51.45	36.36	51.29	36.58	51.13	36.81	63
64	52.43	36.71	52.27	36.94	52.10	37.16	51.94	37.39	64
65	53.24	37.28	53.08	37.51	52.92	37.75	52.75	37.98	65
66	54.06	37.86	53.90	38.09	53.73	38.33	53.56	38.56	66
67	54.88	38.43	54.71	38.67	54.55	38.91	54.38	39.14	67
68	55.70	39.00	55.53	39.25	55.36	39.49	55.19	39.73	68
69	56.52	39.58	56.35	39.82	56.17	40.07	56.00	40.31	69
70	57.34	40.15	57.16	40.40	56.99	40.65	56.81	40.90	70
71	58.16	40.72	57.98	40.98	57.80	41.23	57.62	41.48	71
72	58.98	41.30	58.80	41.55	58.62	41.81	58.43	42.07	72
73	59.80	41.87	59.61	42.13	59.43	42.39	59.24	42.65	73
74	60.62	42.44	60.43	42.71	60.24	42.97	60.06	43.23	74
75	61.44	43.02	61.25	43.29	61.06	43.55	60.87	43.82	75
76	62.26	43.59	62.06	43.86	61.87	44.13	61.68	44.40	76
77	63.07	44.17	62.88	44.44	62.69	44.71	62.49	44.99	77
78	63.89	44.74	63.70	45.02	63.50	45.29	63.30	45.57	78
79	64.71	45.31	64.51	45.59	64.32	45.88	64.11	46.16	79
80	65.53	45.89	65.33	46.17	65.13	46.46	64.93	46.74	80
81	66.35	46.46	66.15	46.75	65.94	47.04	65.74	47.32	81
82	67.17	47.03	66.96	47.33	66.76	47.62	66.55	47.91	82
83	67.99	47.61	67.78	47.90	67.57	48.20	67.36	48.49	83
84	68.81	48.18	68.60	48.48	68.39	48.78	68.17	49.08	84
85	69.63	48.75	69.41	49.06	69.20	49.36	68.98	49.66	85
86	70.45	49.33	70.23	49.63	70.01	49.94	69.80	50.25	86
87	71.27	49.90	71.05	50.21	70.83	50.52	70.61	50.83	87
88	72.09	50.47	71.86	50.79	71.64	51.10	71.42	51.41	88
89	72.90	51.05	72.68	51.37	72.46	51.68	72.23	52.00	89
90	73.72	51.62	73.50	51.94	73.27	52.26	73.04	52.58	90
91	74.54	52.20	74.31	52.52	74.08	52.84	73.85	53.17	91
92	75.36	52.77	75.13	53.10	74.90	53.42	74.66	53.75	92
93	76.18	53.34	75.95	53.67	75.71	54.01	75.48	54.34	93
94	77.00	53.92	76.76	54.25	76.53	54.59	76.29	54.92	94
95	77.82	54.49	77.58	54.83	77.34	55.17	77.10	55.50	95
96	78.64	55.06	78.40	55.41	78.16	55.75	77.91	56.09	96
97	79.46	55.64	79.21	55.98	78.97	56.33	78.72	56.67	97
98	80.28	56.21	80.03	56.56	79.78	56.91	79.53	57.26	98
99	81.10	56.78	80.85	57.14	80.60	57.49	80.35	57.84	99
100	81.92	57.36	81.66	57.71	81.41	58.07	81.16	58.42	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	55 Deg.		54¾ Deg.		54½ Deg.		54¼ Deg.		

Dist	31 Deg.		31¼ Deg.		31½ Deg.		31¾ Deg.		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.86	0.51	0.85	0.52	0.85	0.52	0.85	0.53	1
2	1.71	1.03	1.71	1.04	1.71	1.04	1.70	1.05	2
3	2.57	1.55	2.56	1.56	2.56	1.57	2.55	1.58	3
4	3.43	2.06	3.42	2.08	3.41	2.09	3.40	2.10	4
5	4.29	2.58	4.27	2.59	4.26	2.61	4.25	2.63	5
6	5.14	3.09	5.13	3.11	5.12	3.13	5.10	3.16	6
7	6.00	3.61	5.98	3.63	5.97	3.66	5.95	3.68	7
8	6.86	4.12	6.84	4.15	6.82	4.18	6.80	4.21	8
9	7.71	4.64	7.69	4.67	7.67	4.70	7.65	4.74	9
10	8.57	5.15	8.55	5.19	8.53	5.22	8.50	5.26	10
11	9.43	5.67	9.40	5.71	9.38	5.75	9.35	5.79	11
12	10.29	6.18	10.26	6.23	10.23	6.27	10.20	6.31	12
13	11.14	6.70	11.11	6.74	11.08	6.79	11.05	6.84	13
14	12.00	7.21	11.97	7.26	11.94	7.31	11.90	7.37	14
15	12.86	7.73	12.82	7.78	12.79	7.84	12.76	7.89	15
16	13.71	8.24	13.68	8.30	13.64	8.36	13.61	8.42	16
17	14.57	8.76	14.53	8.82	14.49	8.88	14.46	8.95	17
18	15.43	9.27	15.39	9.34	15.35	9.40	15.31	9.47	18
19	16.29	9.79	16.24	9.86	16.20	9.93	16.16	10.00	19
20	17.14	10.30	17.10	10.38	17.05	10.45	17.01	10.52	20
21	18.00	10.82	17.95	10.89	17.91	10.97	17.86	11.05	21
22	18.86	11.33	18.81	11.41	18.76	11.49	18.71	11.58	22
23	19.71	11.85	19.66	11.93	19.61	12.02	19.56	12.10	23
24	20.57	12.36	20.52	12.45	20.46	12.54	20.41	12.63	24
25	21.43	12.88	21.37	12.97	21.32	13.06	21.26	13.16	25
26	22.29	13.39	22.23	13.49	22.17	13.58	22.11	13.68	26
27	23.14	13.91	23.08	14.01	23.02	14.11	22.96	14.21	27
28	24.00	14.42	23.94	14.53	23.87	14.63	23.81	14.73	28
29	24.86	14.94	24.79	15.04	24.73	15.15	24.66	15.26	29
30	25.71	15.45	25.65	15.56	25.58	15.67	25.51	15.79	30
31	26.57	15.97	26.50	16.08	26.43	16.20	26.36	16.31	31
32	27.43	16.48	27.36	16.60	27.28	16.72	27.21	16.84	32
33	28.29	17.00	28.21	17.12	28.14	17.24	28.06	17.57	33
34	29.14	17.51	29.07	17.64	28.99	17.76	28.91	17.89	34
35	30.00	18.03	29.92	18.16	29.84	18.29	29.76	18.42	35
36	30.86	18.54	30.78	18.68	30.70	18.81	30.61	18.94	36
37	31.72	19.06	31.63	19.19	31.55	19.33	31.46	19.47	37
38	32.57	19.57	32.49	19.71	32.40	19.85	32.31	20.00	38
39	33.43	20.09	33.34	20.23	33.25	20.38	33.16	20.52	39
40	34.29	20.60	34.20	20.75	34.11	20.90	34.01	21.05	40
41	35.14	21.12	35.05	21.27	34.96	21.42	34.86	21.57	41
42	36.00	21.63	35.91	21.79	35.81	21.94	35.71	22.10	42
43	36.86	22.15	36.76	22.31	36.66	22.47	36.57	22.63	43
44	37.72	22.66	37.62	22.83	37.52	22.99	37.42	23.15	44
45	38.57	23.18	38.47	23.34	38.37	23.51	38.27	23.68	45
46	39.43	23.69	39.33	23.86	39.22	24.03	39.12	24.21	46
47	40.29	24.21	40.18	24.38	40.07	24.56	39.97	24.73	47
48	41.14	24.72	41.04	24.90	40.93	25.08	40.82	25.26	48
49	42.00	25.24	41.89	25.42	41.78	25.60	41.67	25.78	49
50	42.86	25.75	42.75	25.94	42.63	26.12	42.52	26.31	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	59 Deg.		58¾ Deg.		58½ Deg.		58¼ Deg.		

Dist.	31 Deg.		31¼ Deg		31½ Deg		31¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	43.72	26.27	43.60	26.46	43.48	26.65	43.37	26.84	51
52	44.57	26.78	44.46	26.98	44.34	27.17	44.22	27.36	52
53	45.43	27.30	45.31	27.49	45.19	27.69	45.07	27.89	53
54	46.29	27.81	46.17	28.01	46.04	28.21	45.92	28.42	54
55	47.14	28.33	47.02	28.53	46.90	28.74	46.77	28.94	55
56	48.00	28.84	47.88	29.05	47.75	29.26	47.62	29.47	56
57	48.86	29.36	48.73	29.57	48.60	29.78	48.47	29.99	57
58	49.72	29.87	49.58	30.09	49.45	30.30	49.32	30.52	58
59	50.57	30.39	50.44	30.61	50.31	30.83	50.17	31.05	59
60	51.43	30.90	51.29	31.13	51.16	31.35	51.02	31.57	60
61	52.29	31.42	52.15	31.65	52.01	31.87	51.87	32.10	61
62	53.14	31.93	53.00	32.16	52.86	32.39	52.72	32.63	62
63	54.00	32.45	53.86	32.68	53.72	32.92	53.57	33.15	63
64	54.86	32.96	54.71	33.20	54.57	33.44	54.42	33.68	64
65	55.72	33.48	55.57	33.72	55.42	33.96	55.27	34.20	65
66	56.57	33.99	56.42	34.24	56.27	34.48	56.12	34.73	66
67	57.43	34.51	57.28	34.76	57.13	35.01	56.98	35.26	67
68	58.29	35.02	58.13	35.28	57.98	35.53	57.82	35.78	68
69	59.14	35.54	58.99	35.80	58.83	36.05	58.67	36.31	69
70	60.00	36.05	59.84	36.31	59.68	36.57	59.52	36.83	70
71	60.86	36.57	60.70	36.83	60.54	37.10	60.37	37.36	71
72	61.72	37.08	61.55	37.35	61.39	37.62	61.23	37.89	72
73	62.57	37.60	62.41	37.87	62.24	38.14	62.08	38.41	73
74	63.43	38.11	63.26	38.39	63.10	38.66	62.93	38.94	74
75	64.29	38.63	64.12	38.91	63.95	39.19	63.78	39.47	75
76	65.14	39.14	64.97	39.43	64.80	39.71	64.63	39.99	76
77	66.00	39.66	65.83	39.95	65.65	40.23	65.48	40.52	77
78	66.86	40.17	66.68	40.46	66.51	40.75	66.33	41.04	78
79	67.72	40.69	67.54	40.98	67.36	41.28	67.18	41.57	79
80	68.57	41.20	68.39	41.50	68.21	41.80	68.03	42.10	80
81	69.43	41.72	69.25	42.02	69.06	42.32	68.88	42.62	81
82	70.29	42.23	70.10	42.54	69.92	42.84	69.73	43.15	82
83	71.14	42.75	70.96	43.06	70.77	43.37	70.58	43.68	83
84	72.00	43.26	71.81	43.58	71.62	43.89	71.43	44.20	84
85	72.86	43.78	72.67	44.10	72.47	44.41	72.28	44.73	85
86	73.72	44.29	73.52	44.61	73.33	44.93	73.13	45.25	86
87	74.57	44.81	74.38	45.13	74.18	45.46	73.98	45.78	87
88	75.43	45.32	75.23	45.65	75.03	45.98	74.83	46.31	88
89	76.29	45.84	76.09	46.17	75.88	46.50	75.68	46.83	89
90	77.15	46.35	76.94	46.69	76.74	47.02	76.53	47.36	90
91	78.00	46.87	77.80	47.21	77.59	47.55	77.38	47.89	91
92	78.86	47.38	78.65	47.73	78.44	48.07	78.23	48.41	92
93	79.72	47.90	79.51	48.25	79.30	48.59	79.08	48.94	93
94	80.57	48.41	80.36	48.76	80.15	49.11	79.93	49.47	94
95	81.43	48.93	81.22	49.28	81.00	49.64	80.78	49.99	95
96	82.29	49.44	82.07	49.80	81.85	50.16	81.63	50.52	96
97	83.15	49.96	82.93	50.32	82.71	50.68	82.48	51.04	97
98	84.00	50.47	83.78	50.84	83.56	51.20	83.33	51.57	98
99	84.86	50.99	84.64	51.36	84.41	51.73	84.18	52.10	99
100	85.72	51.50	85.49	51.88	85.26	52.25	85.04	52.62	100
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat.	Dep.	Lar.	Dist.
	59 Deg.		58¾ Deg		58½ Deg		58¼ Deg.		

Dist.	32 Deg. Lat.	Dep.	32¼ Deg. Lat.	Dep.	32½ Deg. Lat.	Dep.	32¾ Deg. Lat.	Dep.	Dist.
1	0.85	0.53	0.85	0.53	0.84	0.54	0.84	0.54	1
2	1.70	1.06	1.69	1.07	1.69	1.07	1.68	1.08	2
3	2.54	1.59	2.54	1.60	2.53	1.61	2.52	1.62	3
4	3.39	2.12	3.38	2.13	3.37	2.15	3.36	2.16	4
5	4.24	2.65	4.23	2.67	4.22	2.69	4.21	2.70	5
6	5.09	3.18	5.07	3.20	5.06	3.22	5.05	3.25	6
7	5.94	3.71	5.92	3.74	5.90	3.76	5.89	3.79	7
8	6.78	4.24	6.77	4.27	6.75	4.30	6.73	4.33	8
9	7.63	4.77	7.61	4.80	7.59	4.84	7.57	4.87	9
10	8.48	5.30	8.46	5.34	8.43	5.37	8.41	5.41	10
11	9.33	5.83	9.30	5.87	9.28	5.91	9.25	5.95	11
12	10.18	6.36	10.15	6.40	10.12	6.45	10.09	6.49	12
13	11.02	6.89	10.99	6.94	10.96	6.98	10.93	7.03	13
14	11.87	7.42	11.84	7.47	11.81	7.52	11.77	7.57	14
15	12.72	7.95	12.69	8.00	12.65	8.06	12.62	8.11	15
16	13.57	8.48	13.53	8.54	13.49	8.60	13.46	8.66	16
17	14.42	9.01	14.38	9.07	14.34	9.13	14.30	9.20	17
18	15.26	9.54	15.22	9.61	15.18	9.67	15.14	9.74	18
19	16.11	10.07	16.07	10.14	16.02	10.21	15.98	10.28	19
20	16.96	10.60	16.91	10.67	16.87	10.75	16.82	10.82	20
21	17.81	11.13	17.76	11.21	17.71	11.28	17.66	11.36	21
22	18.66	11.66	18.61	11.74	18.55	11.82	18.50	11.90	22
23	19.51	12.19	19.45	12.27	19.40	12.36	19.34	12.44	23
24	20.35	12.72	20.30	12.81	20.24	12.90	20.18	12.98	24
25	21.20	13.25	21.14	13.34	21.08	13.43	21.03	13.52	25
26	22.05	13.78	21.99	13.87	21.93	13.97	21.87	14.07	26
27	22.90	14.31	22.83	14.41	22.77	14.51	22.71	14.61	27
28	23.75	14.84	23.68	14.94	23.61	15.04	23.55	15.15	28
29	24.59	15.37	24.53	15.47	24.46	15.58	24.39	15.69	29
30	25.44	15.90	25.37	16.01	25.30	16.12	25.23	16.23	30
31	26.29	16.43	26.22	16.54	26.15	16.66	26.07	16.77	31
32	27.14	16.96	27.06	17.08	26.99	17.19	26.91	17.31	32
33	27.99	17.49	27.91	17.61	27.83	17.73	27.75	17.85	33
34	28.83	18.02	28.75	18.14	28.68	18.27	28.60	18.39	34
35	29.68	18.55	29.60	18.68	29.52	18.81	29.44	18.93	35
36	30.53	19.08	30.45	19.21	30.36	19.34	30.28	19.48	36
37	31.38	19.61	31.29	19.74	31.21	19.88	31.12	20.02	37
38	32.23	20.14	32.14	20.28	32.05	20.42	31.96	20.56	38
39	33.07	20.67	32.98	20.81	32.89	20.95	32.80	21.10	39
40	33.92	21.20	33.83	21.34	33.74	21.49	33.64	21.64	40
41	34.77	21.73	34.67	21.88	34.58	22.03	34.48	22.18	41
42	35.62	22.26	35.52	22.41	35.42	22.57	35.32	22.73	42
43	36.47	22.79	36.37	22.95	36.27	23.10	36.16	23.26	43
44	37.31	23.32	37.21	23.48	37.11	23.64	37.01	23.80	44
45	38.16	23.85	38.06	24.01	37.95	24.18	37.85	24.34	45
46	39.01	24.38	38.90	24.55	38.80	24.72	38.69	24.88	46
47	39.86	24.91	39.75	25.08	39.64	25.25	39.53	25.43	47
48	40.71	25.44	40.59	25.61	40.48	25.79	40.37	25.97	48
49	41.55	25.97	41.44	26.15	41.33	26.33	41.21	26.51	49
50	42.40	26.50	42.29	26.68	42.17	26.86	42.05	27.05	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	58 Deg.		57¾ Deg.		57½ Deg.		57¼ Deg.		

Dist.	37 Deg. Lat.	Dep.	37¼ Deg. Lat.	Dep.	37½ Deg. Lat.	Dep.	37¾ Deg. Lat.	Dep.	Dist.
51	40.73	30.69	40.60	30.87	40.46	31.05	40.33	31.22	51
52	41.53	31.29	41.39	31.48	41.25	31.66	41.12	31.84	52
53	42.33	31.90	42.19	32.08	42.05	32.26	41.91	32.45	53
54	43.13	32.50	42.98	32.69	42.84	32.87	42.70	33.06	54
55	43.92	33.10	43.78	33.29	43.63	33.48	43.49	33.67	55
56	44.72	33.70	44.58	33.90	44.43	34.09	44.28	34.28	56
57	45.52	34.30	45.37	34.50	45.22	34.70	45.07	34.90	57
58	46.32	34.91	46.17	35.11	46.01	35.31	45.86	35.51	58
59	47.12	35.51	46.96	35.71	46.81	35.92	46.65	36.12	59
60	47.92	36.11	47.76	36.32	47.60	36.53	47.44	36.73	60
61	48.72	36.71	48.56	36.92	48.39	37.13	48.23	37.35	61
62	49.52	37.31	49.35	37.53	49.19	37.74	49.02	37.96	62
63	50.31	37.91	50.15	38.13	49.98	38.35	49.81	38.57	63
64	51.11	38.52	50.94	38.74	50.77	38.96	50.60	39.18	64
65	51.91	39.12	51.74	39.34	51.57	39.57	51.39	39.79	65
66	52.71	39.72	52.54	39.95	52.36	40.18	52.19	40.41	66
67	53.51	40.32	53.33	40.55	53.15	40.79	52.98	41.02	67
68	54.31	40.92	54.13	41.16	53.95	41.40	53.77	41.63	68
69	55.11	41.53	54.92	41.77	54.74	42.00	54.56	42.24	69
70	55.90	42.13	55.72	42.37	55.53	42.61	55.35	42.86	70
71	56.70	42.73	56.52	42.98	56.33	43.22	56.14	43.47	71
72	57.50	43.33	57.31	43.58	57.12	43.83	56.93	44.08	72
73	58.30	43.93	58.11	44.19	57.91	44.44	57.72	44.69	73
74	59.10	44.53	58.90	44.79	58.71	45.05	58.51	45.30	74
75	59.90	45.14	59.70	45.40	59.50	45.66	59.30	45.92	75
76	60.70	45.74	60.50	46.00	60.29	46.27	60.09	46.53	76
77	61.49	46.34	61.29	46.61	61.09	46.87	60.88	47.14	77
78	62.29	46.94	62.09	47.21	61.88	47.48	61.67	47.75	78
79	63.09	47.54	62.88	47.82	62.67	48.09	62.46	48.37	79
80	63.89	48.15	63.68	48.42	63.47	48.70	63.26	48.98	80
81	64.69	48.75	64.48	49.03	64.26	49.31	64.05	49.59	81
82	65.49	49.35	65.27	49.63	65.05	49.92	64.84	50.20	82
83	66.29	49.95	66.07	50.24	65.85	50.53	65.63	50.81	83
84	67.09	50.55	66.86	50.84	66.64	51.14	66.42	51.43	84
85	67.88	51.15	67.66	51.45	67.43	51.74	67.21	52.04	85
86	68.68	51.76	68.46	52.06	68.23	52.35	68.00	52.65	86
87	69.48	52.36	69.25	52.66	69.02	52.96	68.79	53.26	87
88	70.28	52.96	70.05	53.27	69.82	53.57	69.58	53.88	88
89	71.08	53.56	70.84	53.87	70.61	54.18	70.37	54.49	89
90	71.88	54.16	71.64	54.48	71.40	54.79	71.16	55.10	90
91	72.68	54.77	72.44	55.08	72.20	55.40	71.95	55.71	91
92	73.47	55.37	73.23	55.69	72.99	56.01	72.74	56.32	92
93	74.27	55.97	74.03	56.29	73.78	56.61	73.53	56.94	93
94	75.07	56.57	74.82	56.90	74.58	57.22	74.32	57.55	94
95	75.87	57.17	75.62	57.50	75.37	57.83	75.12	58.16	95
96	76.67	57.77	76.42	58.11	76.16	58.44	75.91	58.77	96
97	77.47	58.38	77.21	58.71	76.96	59.05	76.70	59.39	97
98	78.27	58.98	78.01	59.32	77.75	59.66	77.49	60.00	98
99	79.06	59.58	78.80	59.92	78.54	60.27	78.28	60.61	99
100	79.86	60.18	79.60	60.53	79.34	60.88	79.07	61.22	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	53 Deg.		52¾ Deg.		52½ Deg.		52¼ Deg.		

Dist.	38 Deg.		38¼ Deg.		38½ Deg.		38¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.79	0.62	0.79	0.62	0.78	0.62	0.78	0.63	1
2	1.58	1.23	1.57	1.24	1.57	1.24	1.56	1.25	2
3	2.36	1.85	2.36	1.86	2.35	1.87	2.34	1.88	3
4	3.15	2.46	3.14	2.48	3.13	2.49	3.12	2.50	4
5	3.94	3.08	3.93	3.10	3.91	3.11	3.90	3.13	5
6	4.73	3.69	4.71	3.71	4.70	3.74	4.68	3.76	6
7	5.52	4.31	5.50	4.33	5.48	4.36	5.46	4.38	7
8	6.30	4.93	6.28	4.95	6.26	4.98	6.24	5.01	8
9	7.09	5.54	7.07	5.57	7.04	5.60	7.02	5.63	9
10	7.88	6.16	7.85	6.19	7.83	6.23	7.80	6.26	10
11	8.67	6.77	8.64	6.81	8.61	6.85	8.58	6.89	11
12	9.46	7.39	9.42	7.43	9.39	7.47	9.36	7.51	12
13	10.24	8.00	10.21	8.05	10.17	8.09	10.14	8.14	13
14	11.03	8.62	10.99	8.67	10.96	8.72	10.92	8.76	14
15	11.82	9.23	11.78	9.29	11.74	9.34	11.70	9.39	15
16	12.61	9.85	12.57	9.91	12.52	9.96	12.48	10.01	16
17	13.40	10.47	13.35	10.52	13.30	10.58	13.26	10.64	17
18	14.18	11.08	14.14	11.14	14.09	11.21	14.04	11.27	18
19	14.97	11.70	14.92	11.76	14.87	11.83	14.82	11.89	19
20	15.76	12.31	15.71	12.38	15.65	12.45	15.60	12.52	20
21	16.55	12.93	16.49	13.00	16.43	13.07	16.38	13.14	21
22	17.34	13.54	17.28	13.62	17.22	13.70	17.16	13.77	22
23	18.12	14.16	18.06	14.24	18.00	14.32	17.94	14.40	23
24	18.91	14.78	18.85	14.86	18.78	14.94	18.72	15.02	24
25	19.70	15.39	19.63	15.48	19.57	15.56	19.50	15.65	25
26	20.49	16.01	20.42	16.10	20.35	16.19	20.28	16.27	26
27	21.28	16.62	21.20	16.72	21.13	16.81	21.06	16.90	27
28	22.06	17.24	21.99	17.33	21.91	17.43	21.84	17.53	28
29	22.85	17.85	22.77	17.95	22.70	18.05	22.62	18.15	29
30	23.64	18.47	23.56	18.57	23.48	18.68	23.40	18.78	30
31	24.43	19.09	24.34	19.19	24.26	19.30	24.18	19.40	31
32	25.22	19.70	25.13	19.81	25.04	19.92	24.96	20.03	32
33	26.00	20.32	25.92	20.43	25.83	20.54	25.74	20.66	33
34	26.79	20.93	26.70	21.05	26.61	21.17	26.52	21.28	34
35	27.58	21.55	27.49	21.67	27.39	21.79	27.30	21.91	35
36	28.37	22.16	28.27	22.29	28.17	22.41	28.08	22.53	36
37	29.16	22.78	29.06	22.91	28.96	23.03	28.86	23.16	37
38	29.94	23.40	29.84	23.53	29.74	23.66	29.64	23.79	38
39	30.73	24.01	30.63	24.14	30.52	24.28	30.42	24.41	39
40	31.52	24.63	31.41	24.76	31.30	24.90	31.20	25.04	40
41	32.31	25.24	32.20	25.38	32.09	25.52	31.98	25.66	41
42	33.10	25.86	32.98	26.00	32.87	26.15	32.76	26.29	42
43	33.88	26.47	33.77	26.62	33.65	26.77	33.53	26.91	43
44	34.67	27.09	34.55	27.24	34.43	27.39	34.31	27.54	44
45	35.46	27.70	35.34	27.86	35.22	28.01	35.09	28.17	45
46	36.25	28.32	36.12	28.48	36.00	28.64	35.87	28.79	46
47	37.04	28.94	36.91	29.10	36.78	29.26	36.65	29.42	47
48	37.82	29.55	37.70	29.72	37.57	29.88	37.43	30.04	48
49	38.61	30.17	38.48	30.34	38.35	30.50	38.21	30.67	49
50	39.40	30.78	39.27	30.95	39.13	31.13	38.99	31.30	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	52 Deg.		51¾ Deg.		51½ Deg.		51¼ Deg.		

Dist.	33 Deg. Lat.	Dep.	33¼ Deg. Lat.	Dep.	33½ Deg Lat.	Dep.	33¾ Deg. Lat.	Dep.	Dist.
51	42.77	27.78	42.65	27.96	42.53	28.15	42.40	28.33	51
52	43.61	28.32	43.49	28.51	43.36	28.70	43.24	28.89	52
53	44.45	28.87	44.32	29.06	44.20	29.25	44.07	29.45	53
54	45.29	29.41	45.16	29.61	45.03	29.80	44.90	30.00	54
55	46.13	29.96	46.00	30.16	45.86	30.35	45.73	30.56	55
56	46.97	30.50	46.83	30.70	46.70	30.91	46.56	31.11	56
57	47.80	31.04	47.67	31.25	47.53	31.46	47.39	31.67	57
58	48.64	31.59	48.50	31.80	48.37	32.01	48.23	32.22	58
59	49.48	32.13	49.34	32.35	49.20	32.56	49.06	32.78	59
60	50.32	32.68	50.18	32.90	50.03	33.12	49.89	33.33	60
61	51.16	33.22	51.01	33.45	50.87	33.67	50.72	33.89	61
62	52.00	33.77	51.85	33.99	51.70	34.22	51.55	34.45	62
63	52.84	34.31	52.69	34.54	52.53	34.77	52.38	35.00	63
64	53.67	34.86	53.52	35.09	53.37	35.32	5?.21	35.56	64
65	54.51	35.40	54.36	35.64	54.20	35.88	54.05	36.11	65
66	55.35	35.95	55.19	36.19	55.04	36.43	54.88	36.67	66
67	56.19	36.49	56.03	36.74	55.87	36.98	55.71	37.22	67
68	57.03	37.04	56.87	37.28	56.70	37.53	56.54	37.78	68
69	57.87	37.58	57.70	37.83	57.54	38.08	57.37	38.33	69
70	58.71	38.12	58.54	38.38	58.37	38.64	58.20	38.89	70
71	59.55	38.67	59.38	38.93	59.21	39.19	59.03	39.43	71
72	60.38	39.21	60.21	39.48	60.04	39.74	59.87	40.00	72
73	61.22	39.76	61.05	40.03	60.87	40.29	60.70	40.56	73
74	62.06	40.30	61.89	40.57	61.71	40.84	61.53	41.11	74
75	62.90	40.85	62.72	41.12	62.54	41.40	62.36	41.67	75
76	63.74	41.39	63.56	41.67	63.38	41.95	63.19	42.22	76
77	64.58	41.94	64.39	42.22	64.21	42.50	64.02	42.78	77
78	65.42	42.48	65.23	42.77	65.04	43.05	64.85	43.33	78
79	66.25	43.03	66.07	43.32	65.88	43.60	65.69	43.89	79
80	67.09	43.57	66.90	43.86	66.71	44.15	66.52	44.45	80
81	67.93	44.12	67.74	44.41	67.54	44.71	67.35	45.00	81
82	68.77	44.66	68.58	44.96	68.38	45.26	68.18	45.56	82
83	69.61	45.20	69.41	45.51	69.21	45.81	69.01	46.11	83
84	70.45	45.75	70.25	46.06	70.05	46.36	69.84	46.67	84
85	71.29	46.29	71.08	46.60	70.88	46.91	70.67	47.22	85
86	72.13	46.84	71.92	47.15	71.71	47.47	71.51	47.78	86
87	72.96	47.38	72.76	47.70	72.55	48.02	72.34	48.33	87
88	73.80	47.93	73.59	48.25	73.38	48.57	73.17	48.89	88
89	74.64	48.47	74.43	48.80	74.22	49.12	74.00	49.45	89
90	75.48	49.02	75.27	49.35	75.05	49.67	74.83	50.00	90
91	76.32	49.56	76.10	49.89	75.88	50.23	75.66	50.56	91
92	77.16	50.11	76.94	50.44	76.72	50.78	76.50	51.11	92
93	78.00	50.65	77.77	50.99	77.55	51.33	77.33	51.67	93
94	78.83	51.20	78.61	51.54	78.39	51.88	78.16	52.22	94
95	79.67	51.74	79.45	52.09	79.22	52.43	78.99	52.78	95
96	80.51	52.29	80.28	52.64	80.05	52.99	79.82	53.33	96
97	81.35	52.83	81.12	53.18	80.89	53.54	80.65	53.89	97
98	82.19	53.37	81.96	53.73	81.72	54.09	81.48	54.45	98
99	83.03	53.92	82.79	54.28	82.55	54.64	82.32	55.00	99
100	83.87	54.46	83.63	54.83	83.39	55.19	83.15	55.56	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	57 Deg.		56¾ Deg.		56½ Deg.		56¼ Deg.		

Dist.	39 Deg Lat.	39 Deg Dep.	39¼ Deg Lat.	39¼ Deg Dep.	39½ Deg Lat.	39½ Deg Dep.	39¾ Deg Lat.	39¾ Deg Dep.	Dist.
1	0.78	0.63	0.77	0.63	0.77	0.64	0.77	0.64	1
2	1.55	1.26	1.55	1.27	1.54	1.27	1.54	1.28	2
3	2.33	1.89	2.32	1.90	2.31	1.91	2.31	1.92	3
4	3.11	2.52	3.10	2.53	3.09	2.54	3.08	2.56	4
5	3.89	3.15	3.87	3.16	3.86	3.18	3.84	3.20	5
6	4.66	3.78	4.65	3.80	4.63	3.82	4.61	3.84	6
7	5.44	4.41	5.42	4.43	5.40	4.45	5.38	4.48	7
8	6.22	5.03	6.20	5.06	6.17	5.09	6.15	5.12	8
9	6.99	5.66	6.97	5.69	6.94	5.72	6.92	5.75	9
10	7.77	6.29	7.74	6.33	7.72	6.36	7.69	6.39	10
11	8.55	6.92	8.52	6.96	8.49	7.00	8.46	7.03	11
12	9.33	7.55	9.29	7.59	9.26	7.63	9.23	7.67	12
13	10.10	8.18	10.07	8.23	10.03	8.27	9.99	8.31	13
14	10.88	8.81	10.84	8.86	10.80	8.91	10.76	8.95	14
15	11.66	9.44	11.62	9.49	11.57	9.54	11.53	9.59	15
16	12.43	10.07	12.39	10.12	12.35	10.18	12.30	10.23	16
17	13.21	10.70	13.16	10.76	13.12	10.81	13.07	10.87	17
18	13.99	11.33	13.94	11.39	13.89	11.45	13.84	11.51	18
19	14.77	11.96	14.71	12.02	14.66	12.09	14.61	12.15	19
20	15.54	12.59	15.49	12.65	15.43	12.72	15.38	12.79	20
21	16.32	13.22	16.26	13.29	16.20	13.36	16.15	13.43	21
22	17.10	13.84	17.04	13.92	16.98	13.99	16.91	14.07	22
23	17.87	14.47	17.81	14.55	17.75	14.63	17.68	14.71	23
24	18.65	15.10	18.59	15.18	18.52	15.27	18.45	15.35	24
25	19.43	15.73	19.36	15.82	19.29	15.90	19.22	15.99	25
26	20.21	16.36	20.13	16.45	20.06	16.54	19.99	16.63	26
27	20.98	16.99	20.91	17.08	20.83	17.17	20.76	17.26	27
28	21.76	17.62	21.68	17.72	21.61	17.81	21.53	17.90	28
29	22.54	18.25	22.46	18.35	22.38	18.45	22.30	18.54	29
30	23.31	18.88	23.23	18.98	23.15	19.08	23.07	19.18	30
31	24.09	19.51	24.01	19.61	23.92	19.72	23.83	19.82	31
32	24.87	20.14	24.78	20.25	24.69	20.35	24.60	20.46	32
33	25.65	20.77	25.55	20.88	25.46	20.99	25.37	21.10	33
34	26.42	21.40	26.33	21.51	26.24	21.63	26.14	21.74	34
35	27.20	22.03	27.10	22.14	27.01	22.26	26.91	22.38	35
36	27.98	22.66	27.88	22.78	27.78	22.90	27.68	23.02	36
37	28.75	23.28	28.65	23.41	28.55	23.53	28.45	23.66	37
38	29.53	23.91	29.43	24.04	29.32	24.17	29.22	24.30	38
39	30.31	24.54	30.20	24.68	30.09	24.81	29.98	24.94	39
40	31.09	25.17	30.98	25.31	30.86	25.44	30.75	25.58	40
41	31.86	25.80	31.75	25.94	31.64	26.08	31.52	26.22	41
42	32.64	26.43	32.52	26.57	32.41	26.72	32.29	26.86	42
43	33.42	27.06	33.30	27.21	33.18	27.35	33.06	27.50	43
44	34.19	27.69	34.07	27.84	33.95	27.99	33.83	28.14	44
45	34.97	28.32	34.85	38.47	34.72	28.62	34.60	28.77	45
46	35.75	28.95	35.62	29.10	35.49	29.26	35.37	29.41	46
47	36.53	29.58	36.40	29.74	36.27	29.90	36.14	30.05	47
48	37.30	30.21	37.17	30.37	37.04	30.53	36.90	30.69	48
49	38.08	30.84	37.95	31.00	37.81	31.17	37.67	31.33	49
50	38.86	31.47	38.72	31.64	38.58	31.80	38.44	31.97	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		

Dist	39 Deg. Lat.	Dep.	39¼ Deg. Lat.	Dep.	39½ Deg. Lat.	Dep.	39¾ Deg Lat.	Dep.	Dist
51	39.63	32.10	39.49	32.27	39.35	32.44	39.21	32.61	51
52	40.41	32.72	40.27	32.90	40.12	33.08	39.98	33.25	52
53	41.19	33.35	41.04	33.53	40.90	33.71	40.75	33.89	53
54	41.97	33.98	41.82	34.17	41.67	34.35	41.52	34.53	54
55	42.74	34.61	42.59	34.80	42.44	34.98	42.29	35.17	55
56	43.52	35.24	43.37	35.43	43.21	35.62	43.06	35.81	56
57	44.30	35.87	44.14	36.06	43.98	36.26	43.82	36.45	57
58	45.07	36.50	44.91	36.70	44.75	36.89	44.59	37.09	58
59	45.85	37.13	45.69	37.33	45.53	37.53	45.36	37.73	59
60	46.63	37.76	46.46	37.96	46.30	38.16	46.13	38.37	60
61	47.41	38.39	47.24	38.60	47.07	38.80	46.90	39.01	61
62	48.18	39.02	48.01	39.23	47.84	39.44	47.67	39.65	62
63	48.96	39.65	48.79	39.86	48.61	40.07	48.44	40.28	63
64	49.74	40.28	49.56	40.49	49.38	40.71	49.21	40.92	64
65	50.51	40.91	50.34	41.13	50.16	41.35	49.97	41.56	65
66	51.29	41.54	51.11	41.76	50.93	41.98	50.74	42.20	66
67	52.07	42.16	51.88	42.39	51.70	42.62	51.51	42.84	67
68	52.85	42.79	52.66	43.02	52.47	43.25	52.28	43.48	68
69	53.52	43.42	53.43	43.66	53.24	43.89	53.05	44.12	69
70	54.40	44.05	54.21	44.29	54.01	44.53	53.82	44.76	70
71	55.18	44.68	54.98	44.92	54.79	45.16	54.59	45.40	71
72	55.95	45.31	55.76	45.55	55.56	45.80	55.36	46.04	72
73	56.73	45.94	56.53	46.19	56.33	46.43	56.13	46.68	73
74	57.51	46.57	57.31	46.82	57.10	47.07	56.89	47.32	74
75	58.29	47.20	58.08	47.45	57.87	47.71	57.66	47.96	75
76	59.06	47.83	58.85	48.09	58.64	48.34	58.43	48.60	76
77	59.84	48.46	59.63	48.72	59.42	48.98	59.20	49.24	77
78	60.62	49.09	60.40	49.35	60.19	49.61	59.97	49.88	78
79	61.39	49.72	61.18	49.98	60.96	50.25	60.74	50.52	79
80	62.17	50.35	61.95	50.62	61.73	50.89	61.51	51.16	80
81	62.95	50.97	62.73	51.25	62.50	51.52	62.28	51.79	81
82	63.73	51.60	63.50	51.88	63.27	52.16	63.04	52.43	82
83	64.50	52.23	64.27	52.51	64.04	52.79	63.81	53.07	83
84	65.28	52.86	65.05	53.15	64.82	53.43	64.58	53.71	84
85	66.06	53.49	65.82	53.78	65.59	54.07	65.35	54.35	85
86	66.83	54.12	66.60	54.41	66.36	54.70	66.12	54.99	86
87	67.61	54.75	67.37	55.05	67.13	55.34	66.89	55.63	87
88	68.39	55.38	68.15	55.68	67.90	55.97	67.66	56.27	88
89	69.17	56.01	68.92	56.32	68.67	56.61	68.43	56.91	89
90	69.94	56.64	69.70	56.94	69.45	57.25	69.20	57.55	90
91	70.72	57.27	70.47	57.58	70.22	57.88	69.96	58.19	91
92	71.50	57.90	71.24	58.21	70.99	58.52	70.73	58.83	92
93	72.27	58.53	72.02	58.84	71.76	59.16	71.50	59.47	93
94	73.05	59.16	72.79	59.47	72.53	59.79	72.27	60.11	94
95	73.83	59.79	73.57	60.11	73.30	60.43	73.04	60.75	95
96	74.61	60.41	74.34	60.74	74.08	61.06	73.81	61.39	96
97	75.38	61.04	75.12	61.37	74.85	61.70	74.58	62.03	97
98	76.16	61.67	75.89	62.01	75.62	62.34	75.35	62.66	98
99	76.94	62.30	76.66	62.64	76.39	62.97	76.12	63.30	99
100	77.71	62.93	77.44	63.37	77.16	63.61	76.88	63.94	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		

Dist	41 Deg.		40½ Deg.		41 Deg.		40¾ Deg.		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1					1.75	1.55	1.75	1.55	1
2					1.13	1.31	1.51	1.31	2
3	2.26	1.96	2.26	1.94	2.29	1.96	2.27	1.96	3
4	3.06	2.57	2.95	1.93	2.84	2.90	2.82	2.61	4
5	3.85	3.22	3.63	3.22	3.84	3.25	3.73	3.26	5
6	4.53	3.96	4.50	3.90	4.56	3.96	4.55	3.92	6
7	5.40	5.14	5.24	4.51	5.22	4.55	5.33	4.57	7
8	6.04	5.24	6.11	5.71	6.08	5.20	6.06	5.22	8
9	6.68	5.57	6.07	5.82	6.94	5.84	6.82	5.87	9
10	7.55	6.41	7.55	6.46	7.90	6.49	7.58	6.53	10
11	8.44	7.06	8.90	7.11	8.36	7.14	8.34	7.18	11
12	9.06	7.71	9.18	7.75	9.13	7.79	9.09	7.83	12
13	9.86	8.26	9.82	8.40	9.69	8.44	8.85	8.49	13
14	10.73	9.00	10.59	9.05	10.65	9.09	10.61	9.14	14
15	11.46	9.66	11.45	9.69	11.41	9.74	11.36	9.79	15
16	12.12	10.30	12.20	10.34	12.17	10.39	12.11	10.44	16
17	12.91	10.91	12.97	10.98	12.83	11.04	12.88	11.10	17
18	13.81	11.57	13.74	11.63	13.69	11.69	13.64	11.75	18
19	14.31	12.11	14.51	12.28	14.45	12.34	14.39	12.40	19
20	15.02	12.86	15.29	12.92	15.21	12.98	15.15	13.06	20
21	16.05	13.50	16.05	13.57	15.97	13.64	15.90	13.71	21
22	16.85	14.14	16.79	14.21	16.73	14.29	16.67	14.36	22
23	17.62	14.78	17.56	14.86	17.49	14.94	17.42	15.01	23
24	18.20	15.61	18.32	15.51	18.25	15.59	18.18	15.67	24
25	19.19	16.07	19.08	16.15	19.01	16.24	18.94	16.32	25
26	19.98	16.71	19.84	16.80	19.77	16.89	19.70	16.97	26
27	20.64	17.36	20.61	17.45	20.53	17.54	20.45	17.62	27
28	21.48	18.00	21.37	18.09	21.29	18.19	21.21	18.28	28
29	22.00	18.64	22.13	18.74	22.05	18.85	21.97	18.93	29
30	22.98	19.28	22.90	19.38	22.81	19.48	22.73	19.58	30
31	23.75	19.95	23.66	20.03	23.57	20.13	23.48	20.24	31
32	24.51	20.57	24.42	20.68	24.33	20.79	24.24	20.89	32
33	25.36	21.31	25.19	21.32	25.09	21.43	25.00	21.54	33
34	26.05	21.85	25.95	21.97	25.85	22.08	25.76	22.19	34
35	26.81	22.50	26.71	22.61	26.61	22.73	26.51	22.85	35
36	27.58	23.14	27.48	23.26	27.37	23.38	27.27	23.50	36
37	28.34	23.78	28.24	23.91	28.13	24.03	28.02	24.15	37
38	29.11	24.43	29.00	24.55	28.90	24.68	28.79	24.80	38
39	29.88	25.07	29.77	25.20	29.66	25.33	29.54	25.45	39
40	30.64	25.71	30.53	25.84	30.42	25.98	30.30	26.11	40
41	31.41	26.35	31.29	26.49	31.18	26.63	31.06	26.76	41
42	32.17	27.00	32.06	27.14	31.94	27.28	31.82	27.42	42
43	32.94	27.64	32.82	27.78	32.70	27.93	32.58	28.07	43
44	33.71	28.29	33.58	28.43	33.46	28.58	33.33	28.72	44
45	34.47	28.93	34.35	29.08	34.22	29.23	34.09	29.37	45
46	35.24	29.57	35.11	29.72	34.98	29.87	34.85	30.03	46
47	36.08	30.21	35.87	30.37	35.74	30.52	35.61	30.68	47
48	36.77	30.85	36.54	31.01	36.50	31.17	36.36	31.33	48
49	37.54	31.50	37.40	31.66	37.26	31.82	37.12	31.99	49
50	38.50	32.14	38.16	32.31	38.02	32.47	37.88	32.64	50
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	50 Deg.		49½ Deg.		49¼ Deg.		49¾ Deg.		

Dist.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
51	39.07	32.78	38.92	32.95	38.78	33.12	38.64	33.29	51
52	39.83	33.42	39.69	33.60	39.54	33.77	39.39	33.94	52
53	40.60	34.07	40.45	34.24	40.30	34.42	40.15	34.60	53
54	41.37	34.71	41.21	34.89	41.06	35.07	40.91	35.25	54
55	42.13	35.35	41.98	35.54	41.82	35.72	41.67	35.90	55
56	42.90	36.00	42.74	36.18	42.58	36.37	42.42	36.55	56
57	43.66	36.64	43.50	36.83	43.34	37.02	43.18	37.21	57
58	44.43	37.28	44.27	37.48	44.10	37.67	43.94	37.86	58
59	45.20	37.92	45.03	38.12	44.86	38.32	44.70	38.51	59
60	45.96	38.57	45.79	38.77	45.62	38.97	45.45	39.17	60
61	46.73	39.21	46.56	39.41	46.38	39.62	46.21	39.82	61
62	47.49	39.85	47.32	40.06	47.15	40.27	46.97	40.47	62
63	48.26	40.50	48.08	40.71	47.91	40.92	47.73	41.12	63
64	49.03	41.14	48.85	41.35	48.67	41.56	48.48	41.78	64
65	49.79	41.78	49.61	42.00	49.43	42.21	49.24	42.43	65
66	50.56	42.42	50.37	42.64	50.19	42.86	50.00	43.08	66
67	51.32	43.07	51.14	43.29	50.95	43.51	50.76	43.73	67
68	52.09	43.71	51.90	43.94	51.71	44.16	51.51	44.39	68
69	52.86	44.35	52.66	44.58	52.47	44.81	52.27	45.04	69
70	53.62	45.00	53.43	45.23	53.23	45.46	53.03	45.69	70
71	54.39	45.64	54.19	45.87	53.99	46.11	53.79	46.35	71
72	55.16	46.28	54.95	46.52	54.75	46.76	54.54	47.00	72
73	55.92	46.92	55.72	47.17	55.51	47.41	55.30	47.65	73
74	56.69	47.57	56.48	47.81	56.27	48.06	56.06	48.30	74
75	57.45	48.21	57.24	48.46	57.03	48.71	56.82	48.96	75
76	58.22	48.85	58.01	49.11	57.79	49.36	57.57	49.61	76
77	58.99	49.49	58.77	49.75	58.55	50.01	58.33	50.26	77
78	59.75	50.14	59.53	50.40	59.31	50.66	59.09	50.92	78
79	60.52	50.78	60.30	51.04	60.07	51.31	59.85	51.57	79
80	61.28	51.42	61.06	51.69	60.83	51.96	60.61	52.22	80
81	62.05	52.07	61.82	52.34	61.59	52.61	61.36	52.87	81
82	62.82	52.71	62.59	52.98	62.35	53.25	62.12	53.53	82
83	63.58	53.35	63.35	53.63	63.11	53.90	62.88	54.18	83
84	64.35	53.99	64.11	54.27	63.87	54.55	63.64	54.83	84
85	65.11	54.64	64.87	54.92	64.63	55.20	64.39	55.48	85
86	65.88	55.28	65.64	55.57	65.39	55.85	65.15	56.14	86
87	66.65	55.92	66.40	56.21	66.16	56.50	65.91	56.79	87
88	67.41	56.57	67.16	56.86	66.92	57.15	66.67	57.44	88
89	68.18	57.21	67.93	57.50	67.68	57.80	67.42	58.10	89
90	68.94	57.85	68.69	58.15	68.44	58.45	68.18	58.75	90
91	69.71	58.49	69.45	58.80	69.20	59.10	68.94	59.40	91
92	70.48	59.14	70.22	59.44	69.96	59.75	69.70	60.05	92
93	71.24	59.78	70.98	60.09	70.72	60.40	70.45	60.71	93
94	72.01	60.42	71.74	60.74	71.48	61.05	71.21	61.36	94
95	72.77	61.06	72.51	61.38	72.24	61.70	71.97	62.01	95
96	73.54	61.71	73.27	62.03	73.00	62.35	72.73	62.66	96
97	74.31	62.35	74.03	62.67	73.76	63.00	73.48	63.32	97
98	75.07	62.99	74.80	63.32	74.52	63.65	74.24	63.97	98
99	75.84	63.64	75.56	63.97	75.28	64.30	75.00	64.62	99
100	76.60	64.28	76.32	64.61	76.04	64.94	75.76	65.28	100
Dist.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

L

Dist.	41 Deg.		41¼ Deg.		41½ Deg.		41¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.75	0.66	0.75	0.66	0.75	0.66	0.75	0.67	1
2	1.51	1.31	1.50	1.32	1.50	1.33	1.49	1.33	2
3	2.26	1.97	2.26	1.98	2.25	1.99	2.24	2.00	3
4	3.02	2.62	3.01	2.64	3.00	2.65	2.98	2.66	4
5	3.77	3.28	3.76	3.30	3.74	3.31	3.73	3.33	5
6	4.53	3.94	4.51	3.96	4.49	3.98	4.48	4.00	6
7	5.28	4.59	5.26	4.62	5.24	4.64	5.22	4.66	7
8	6.04	5.25	6.01	5.27	5.99	5.30	5.97	5.33	8
9	6.79	5.90	6.77	5.93	6.74	5.96	6.71	5.99	9
10	7.55	6.56	7.52	6.59	7.49	6.63	7.46	6.66	10
11	8.30	7.22	8.27	7.25	8.24	7.29	8.21	7.32	11
12	9.06	7.87	9.02	7.91	8.99	7.95	8.95	7.99	12
13	9.81	8.53	9.77	8.57	9.74	8.61	9.70	8.66	13
14	10.57	9.18	10.53	9.23	10.49	9.28	10.44	9.32	14
15	11.32	9.84	11.28	9.89	11.23	9.94	11.19	9.99	15
16	12.08	10.50	12.03	10.55	11.98	10.60	11.94	10.65	16
17	12.83	11.15	12.78	11.21	12.73	11.26	12.68	11.32	17
18	13.58	11.81	13.53	11.87	13.48	11.93	13.43	11.99	18
19	14.34	12.47	14.28	12.53	14.23	12.59	14.18	12.65	19
20	15.09	13.12	15.04	13.19	14.98	13.25	14.92	13.32	20
21	15.85	13.78	15.79	13.85	15.73	13.91	15.67	13.98	21
22	16.60	14.43	16.54	14.51	16.48	14.58	16.41	14.65	22
23	17.36	15.09	17.29	15.16	17.23	15.24	17.16	15.32	23
24	18.11	15.75	18.04	15.82	17.97	15.90	17.91	15.98	24
25	18.87	16.40	18.80	16.48	18.72	16.57	18.65	16.65	25
26	19.62	17.06	19.55	17.14	19.47	17.23	19.40	17.31	26
27	20.38	17.71	20.30	17.80	20.22	17.89	20.14	17.98	27
28	21.13	18.37	21.05	18.46	20.97	18.55	20.89	18.64	28
29	21.89	19.03	21.80	19.12	21.72	19.22	21.64	19.31	29
30	22.64	19.68	22.56	19.78	22.47	19.88	22.38	19.98	30
31	23.40	20.34	23.31	20.44	23.22	20.54	23.13	20.64	31
32	24.15	20.99	24.06	21.10	23.97	21.20	23.87	21.31	32
33	24.91	21.65	24.81	21.76	24.72	21.87	24.62	21.97	33
34	25.66	22.31	25.56	22.42	25.46	22.53	25.37	22.64	34
35	26.41	22.96	26.31	23.08	26.21	23.19	26.11	23.31	35
36	27.17	23.62	27.07	23.74	26.96	23.85	26.86	23.97	36
37	27.92	24.27	27.82	24.40	27.71	24.52	27.60	24.64	37
38	28.68	24.93	28.57	25.06	28.46	25.18	28.35	25.30	38
39	29.43	25.59	29.32	25.71	29.21	25.84	29.10	25.97	39
40	30.19	26.24	30.07	26.37	29.96	26.50	29.84	26.64	40
41	30.94	26.90	30.83	27.03	30.71	27.17	30.59	27.30	41
42	31.70	27.55	31.58	27.69	31.46	27.83	31.33	27.97	42
43	32.45	28.21	32.33	28.35	32.21	28.49	32.08	28.63	43
44	33.21	28.87	33.08	29.01	32.95	29.16	32.83	29.30	44
45	33.96	29.52	33.83	29.67	33.70	29.82	33.57	29.97	45
46	34.72	30.18	34.58	30.33	34.45	30.48	34.32	30.63	46
47	35.47	30.83	35.34	30.99	35.20	31.14	35.06	31.30	47
48	36.23	31.49	36.09	31.65	35.95	31.81	35.81	31.96	48
49	36.98	32.15	36.84	32.31	36.70	32.47	36.56	32.63	49
50	37.74	32.80	37.59	32.97	37.45	33.13	37.30	33.29	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	49 Deg.		48¾ Deg.		48½ Deg.		48¼ Deg.		

Dist	41 Deg. Lat.	41 Deg. Dep.	41¼ Deg. Lat.	41¼ Deg. Dep.	41½ Deg. Lat	41½ Deg. Dep.	41¾ Deg. Lat.	41¾ Deg. Dep.	Dist
51	38.49	33.46	38.34	33.63	38.20	33.79	38.05	33.96	51
52	39.24	34.12	39.10	34.29	38.95	34.46	38.79	34.63	52
53	40.00	34.77	39.85	34.95	39.69	35.12	39.54	35.29	53
54	40.75	35.43	40.60	35.60	40.44	35.78	40.29	35.96	54
55	41.51	36.08	41.35	36.26	41.19	36.44	41.03	36.62	55
56	42.26	36.74	42.10	36.92	41.94	37.11	41.78	37.29	56
57	43.02	37.40	42.85	37.58	42.69	37.77	42.53	37.96	57
58	43.77	38.05	43.61	38.24	43.44	38.43	43.27	38.62	58
59	44.53	38.71	44.36	38.90	44.19	39.09	44.02	39.29	59
60	45.28	39.36	45.11	39.56	44.94	39.76	44.76	39.95	60
61	46.04	40.02	45.86	40.22	45.69	40.42	45.51	40.62	61
62	46.79	40.68	46.61	40.88	46.44	41.08	46.26	41.28	62
63	47.55	41.33	47.37	41.54	47.18	41.75	47.00	41.95	63
64	48.30	41.99	48.12	42.20	47.93	42.41	47.75	42.62	64
65	49.06	42.64	48.87	42.86	48.68	43.07	48.49	43.28	65
66	49.81	43.30	49.62	43.52	49.43	43.73	49.24	43.95	66
67	50.57	43.96	50.37	44.18	50.18	44.40	49.99	44.61	67
68	51.32	44.61	51.13	44.84	50.93	45.06	50.73	45.28	68
69	52.07	45.27	51.88	45.49	51.68	45.72	51.48	45.95	69
70	52.83	45.92	52.63	46.15	52.43	46.38	52.22	46.61	70
71	53.58	46.58	53.38	46.81	53.18	47.05	52.97	47.28	71
72	54.34	47.24	54.13	47.47	53.92	47.71	53.72	47.94	72
73	55.09	47.89	54.88	48.13	54.67	48.37	54.46	48.61	73
74	55.85	48.55	55.64	48.79	55.42	49.03	55.21	49.28	74
75	56.60	49.20	56.39	49.45	56.17	49.70	55.95	49.94	75
76	57.36	49.86	57.14	50.11	56.92	50.36	56.70	50.61	76
77	58.11	50.52	57.89	50.77	57.67	51.02	57.45	51.27	77
78	58.87	51.17	58.64	51.43	58.42	51.68	58.19	51.94	78
79	59.62	51.83	59.40	52.09	59.17	52.35	58.94	52.60	79
80	60.38	52.48	60.15	52.75	59.92	53.01	59.68	53.27	80
81	61.13	53.14	60.90	53.41	60.67	53.67	60.43	53.94	81
82	61.89	53.80	61.65	54.07	61.41	54.33	61.18	54.60	82
83	62.64	54.45	62.40	54.73	62.16	55.00	61.92	55.27	83
84	63.40	55.11	63.15	55.38	62.91	55.66	62.67	55.93	84
85	64.15	55.76	63.91	56.04	63.66	56.32	63.41	56.60	85
86	64.90	56.42	64.66	56.70	64.41	56.99	64.16	57.27	86
87	65.66	57.08	65.41	57.36	65.16	57.65	64.91	57.93	87
88	66.41	57.73	66.16	58.02	65.91	58.31	65.65	58.60	88
89	67.17	58.39	66.91	58.68	66.66	58.97	66.40	59.26	89
90	67.92	59.05	67.67	59.34	67.41	59.64	67.15	59.93	90
91	68.68	59.70	68.42	60.00	68.15	60.30	67.89	60.60	91
92	69.43	60.36	69.17	60.66	68.90	60.96	68.64	61.26	92
93	70.19	61.01	69.92	61.32	69.65	61.62	69.38	61.93	93
94	70.94	61.67	70.67	61.98	70.40	62.29	70.13	62.59	94
95	71.70	62.33	71.42	62.64	71.15	62.95	70.88	63.26	95
96	72.45	62.98	72.18	63.30	71.90	63.61	71.62	63.92	96
97	73.21	63.69	72.93	63.96	72.65	64.27	72.37	64.59	97
98	73.96	64.29	73.68	64.62	73.40	64.94	73.11	65.26	98
99	74.72	64.95	74.43	65.28	74.15	65.60	73.86	65.92	99
100	75.47	65.61	75.18	65.93	74.90	66.26	74.61	66.59	100
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	49 Deg.		48¾ Deg.		48½ Deg.		48¼ Deg.		

Dist.	37 Deg. Lat.	Dep.	37¼ Deg. Lat.	Dep.	37½ Deg Lat.	Dep.	37¾ Deg Lat.	Dep.	Dist.
1	0.80	0.60	0.80	0.61	0.79	0.61	0.79	0.61	1
2	1.60	1.20	1.59	1.21	1.59	1.22	1.58	1.22	2
3	2.40	1.81	2.39	1.82	2.38	1.83	2.37	1.84	3
4	3.19	2.41	3.18	2.42	3.17	2.43	3.16	2.45	4
5	3.99	3.01	3.98	3.03	3.97	3.04	3.95	3.06	5
6	4.79	3.61	4.78	3.63	4.76	3.65	4.74	3.67	6
7	5.59	4.21	5.57	4.24	5.55	4.26	5.53	4.29	7
8	6.39	4.81	6.37	4.84	6.35	4.87	6.33	4.90	8
9	7.19	5.42	7.16	5.45	7.14	5.48	7.12	5.51	9
10	7.99	6.02	7.96	6.05	7.93	6.09	7.91	6.12	10
11	8.78	6.62	8.76	6.66	8.73	6.70	8.70	6.73	11
12	9.58	7.22	9.55	7.26	9.52	7.31	9.49	7.35	12
13	10.38	7.82	10.35	7.87	10.31	7.91	10.28	7.96	13
14	11.18	8.43	11.14	8.47	11.11	8.52	11.07	8.57	14
15	11.98	9.03	11.94	9.08	11.90	9.13	11.86	9.18	15
16	12.78	9.63	12.74	9.68	12.69	9.74	12.65	9.80	16
17	13.58	10.23	13.53	10.29	13.49	10.35	13.44	10.41	17
18	14.38	10.83	14.33	10.90	14.28	10.96	14.23	11.02	18
19	15.17	11.43	15.12	11.50	15.07	11.57	15.02	11.63	19
20	15.97	12.04	15.92	12.11	15.87	12.18	15.81	12.24	20
21	16.77	12.64	16.72	12.71	16.66	12.78	16.60	12.86	21
22	17.57	13.24	17.51	13.32	17.45	13.39	17.40	13.47	22
23	18.37	13.84	18.31	13.92	18.25	14.00	18.19	14.08	23
24	19.17	14.44	19.10	14.53	19.04	14.61	18.98	14.69	24
25	19.97	15.05	19.90	15.13	19.83	15.22	19.77	15.31	25
26	20.76	15.65	20.70	15.74	20.63	15.83	20.56	15.92	26
27	21.56	16.25	21.49	16.34	21.42	16.44	21.35	16.53	27
28	22.36	16.85	22.29	16.95	22.21	17.05	22.14	17.14	28
29	23.16	17.45	23.08	17.55	23.01	17.65	22.93	17.75	29
30	23.96	18.05	23.88	18.16	23.80	18.26	23.72	18.37	30
31	24.76	18.66	24.68	18.76	24.59	18.87	24.51	18.98	31
32	25.56	19.26	25.47	19.37	25.39	19.48	25.30	19.59	32
33	26.35	19.86	26.27	19.97	26.18	20.09	26.09	20.20	33
34	27.15	20.46	27.06	20.58	26.97	20.70	26.88	20.82	34
35	27.95	21.06	27.86	21.19	27.77	21.31	27.67	21.43	35
36	28.75	21.67	28.66	21.79	28.56	21.92	28.46	22.04	36
37	29.55	22.27	29.45	22.40	29.35	22.52	29.26	22.65	37
38	30.35	22.87	30.25	23.00	30.15	23.13	30.05	23.26	38
39	31.15	23.47	31.04	23.61	30.94	23.74	30.84	23.88	39
40	31.95	24.07	31.84	24.21	31.73	24.35	31.63	24.49	40
41	32.74	24.67	32.64	24.82	32.53	24.96	32.42	25.10	41
42	33.54	25.28	33.43	25.42	33.32	25.57	33.21	25.71	42
43	34.34	25.88	34.23	26.03	34.11	26.18	34.00	26.33	43
44	35.14	26.48	35.02	26.63	34.91	26.79	34.79	26.94	44
45	35.94	27.08	35.82	27.24	35.70	27.39	35.58	27.55	45
46	36.74	27.68	36.62	27.84	36.49	28.00	36.37	28.16	46
47	37.54	28.29	37.41	28.45	37.29	28.61	37.16	28.77	47
48	38.33	28.89	38.21	29.05	38.08	29.22	37.95	29.39	48
49	39.13	29.49	39.00	29.66	38.87	29.83	38.74	30.00	49
50	39.93	30.09	39.80	30.26	39.67	30.44	39.53	30.61	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dist.
	53 Deg.		52¾ Deg.		52½ Deg.		52¼ Deg.		

Dist.	37 Deg. Lat.	Dep.	37¼ Deg. Lat.	Dep.	37½ Deg. Lat.	Dep.	37¾ Deg. Lat.	Dep.	Dist.
51	40.73	30.69	40.60	30.87	40.46	31.05	40.33	31.22	51
52	41.53	31.29	41.39	31.48	41.25	31.66	41.12	31.84	52
53	42.33	31.90	42.19	32.08	42.05	32.26	41.91	32.45	53
54	43.13	32.50	42.98	32.69	42.84	32.87	42.70	33.06	54
55	43.92	33.10	43.78	33.29	43.63	33.48	43.49	33.67	55
56	44.72	33.70	44.58	33.90	44.43	34.09	44.28	34.28	56
57	45.52	34.30	45.37	34.50	45.22	34.70	45.07	34.90	57
58	46.32	34.91	46.17	35.11	46.01	35.31	45.86	35.51	58
59	47.12	35.51	46.96	35.71	46.81	35.92	46.65	36.12	59
60	47.92	36.11	47.76	36.32	47.60	36.53	47.44	36.73	60
61	48.72	36.71	48.56	36.92	48.39	37.13	48.23	37.35	61
62	49.52	37.31	49.35	37.53	49.19	37.74	49.02	37.96	62
63	50.31	37.91	50.15	38.13	49.98	38.35	49.81	38.57	63
64	51.11	38.52	50.94	38.74	50.77	38.96	50.60	39.18	64
65	51.91	39.12	51.74	39.34	51.57	39.57	51.39	39.79	65
66	52.71	39.72	52.54	39.95	52.36	40.18	52.19	40.41	66
67	53.51	40.32	53.33	40.55	53.15	40.79	52.98	41.02	67
68	54.31	40.92	54.13	41.16	53.95	41.40	53.77	41.63	68
69	55.11	41.53	54.92	41.77	54.74	42.00	54.56	42.24	69
70	55.90	42.13	55.72	42.37	55.53	42.61	55.35	42.86	70
71	56.70	42.73	56.52	42.98	56.33	43.22	56.14	43.47	71
72	57.50	43.33	57.31	43.58	57.12	43.83	56.93	44.08	72
73	58.30	43.93	58.11	44.19	57.91	44.44	57.72	44.69	73
74	59.10	44.53	58.90	44.79	58.71	45.05	58.51	45.30	74
75	59.90	45.14	59.70	45.40	59.50	45.66	59.30	45.92	75
76	60.70	45.74	60.50	46.00	60.29	46.27	60.09	46.53	76
77	61.49	46.34	61.29	46.61	61.09	46.87	60.88	47.14	77
78	62.29	46.94	62.09	47.21	61.88	47.48	61.67	47.75	78
79	63.09	47.54	62.88	47.82	62.67	48.09	62.46	48.37	79
80	63.89	48.15	63.68	48.42	63.47	48.70	63.26	48.98	80
81	64.69	48.75	64.48	49.03	64.26	49.31	64.05	49.59	81
82	65.49	49.35	65.27	49.63	65.05	49.92	64.84	50.20	82
83	66.29	49.95	66.07	50.24	65.85	50.53	65.63	50.81	83
84	67.09	50.55	66.86	50.84	66.64	51.14	66.42	51.43	84
85	67.88	51.15	67.66	51.45	67.43	51.74	67.21	52.04	85
86	68.68	51.76	68.46	52.06	68.23	52.35	68.00	52.65	86
87	69.48	52.36	69.25	52.66	69.02	52.96	68.79	53.26	87
88	70.28	52.96	70.05	53.27	69.82	53.57	69.58	53.88	88
89	71.08	53.56	70.84	53.87	70.61	54.18	70.37	54.49	89
90	71.88	54.16	71.64	54.48	71.40	54.79	71.16	55.10	90
91	72.68	54.77	72.44	55.08	72.20	55.40	71.95	55.71	91
92	73.47	55.37	73.23	55.69	72.99	56.01	72.74	56.32	92
93	74.27	55.97	74.03	56.29	73.78	56.61	73.53	56.94	93
94	75.07	56.57	74.82	56.90	74.58	57.22	74.32	57.55	94
95	75.87	57.17	75.62	57.50	75.37	57.83	75.12	58.16	95
96	76.67	57.77	76.42	58.11	76.16	58.44	75.91	58.77	96
97	77.47	58.38	77.21	58.71	76.96	59.05	76.70	59.39	97
98	78.27	58.98	78.01	59.32	77.75	59.66	77.49	60.00	98
99	79.06	59.58	78.80	59.92	78.54	60.27	78.28	60.61	99
100	79.86	60.18	79.60	60.53	79.34	60.88	79.07	61.22	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	53 Deg		52¾ Deg		52½ Deg		52¼ Deg		

Dist	38 Deg. Lat.	Dep.	38¼ Deg. Lat.	Dep.	38½ Deg. Lat.	Dep.	38¾ Deg. Lat.	Dep.	Dist.
1	0.79	0.62	0.79	0.62	0.78	0.62	0.78	0.63	1
2	1.58	1.23	1.57	1.24	1.57	1.24	1.56	1.25	2
3	2.36	1.85	2.36	1.86	2.35	1.87	2.34	1.88	3
4	3.15	2.46	3.14	2.48	3.13	2.49	3.12	2.50	4
5	3.94	3.08	3.93	3.10	3.91	3.11	3.90	3.13	5
6	4.73	3.69	4.71	3.71	4.70	3.74	4.68	3.76	6
7	5.52	4.31	5.50	4.33	5.48	4.36	5.46	4.38	7
8	6.30	4.93	6.28	4.95	6.26	4.98	6.24	5.01	8
9	7.09	5.54	7.07	5.57	7.04	5.60	7.02	5.63	9
10	7.88	6.16	7.85	6.19	7.83	6.23	7.80	6.26	10
11	8.67	6.77	8.64	6.81	8.61	6.85	8.58	6.89	11
12	9.46	7.39	9.42	7.43	9.39	7.47	9.36	7.51	12
13	10.24	8.00	10.21	8.05	10.17	8.09	10.14	8.14	13
14	11.03	8.62	10.99	8.67	10.96	8.72	10.92	8.76	14
15	11.82	9.23	11.78	9.29	11.74	9.34	11.70	9.39	15
16	12.61	9.85	12.57	9.91	12.52	9.96	12.48	10.01	16
17	13.40	10.47	13.35	10.52	13.30	10.58	13.26	10.64	17
18	14.18	11.08	14.14	11.14	14.09	11.21	14.04	11.27	18
19	14.97	11.70	14.92	11.76	14.87	11.83	14.82	11.89	19
20	15.76	12.31	15.71	12.38	15.65	12.45	15.60	12.52	20
21	16.55	12.93	16.49	13.00	16.43	13.07	16.38	13.14	21
22	17.34	13.54	17.28	13.62	17.22	13.70	17.16	13.77	22
23	18.12	14.16	18.06	14.24	18.00	14.32	17.94	14.40	23
24	18.91	14.78	18.85	14.86	18.78	14.94	18.72	15.02	24
25	19.70	15.39	19.63	15.48	19.57	15.56	19.50	15.65	25
26	20.49	16.01	20.42	16.10	20.35	16.19	20.28	16.27	26
27	21.28	16.62	21.20	16.72	21.13	16.81	21.06	16.90	27
28	22.06	17.24	21.99	17.33	21.91	17.43	21.84	17.53	28
29	22.85	17.85	22.77	17.95	22.70	18.05	22.62	18.15	29
30	23.64	18.47	23.56	18.57	23.48	18.68	23.40	18.78	30
31	24.43	19.09	24.34	19.19	24.26	19.30	24.18	19.40	31
32	25.22	19.70	25.13	19.81	25.04	19.92	24.96	20.03	32
33	26.00	20.32	25.92	20.43	25.83	20.54	25.74	20.66	33
34	26.79	20.93	26.70	21.05	26.61	21.17	26.52	21.28	34
35	27.58	21.55	27.49	21.67	27.39	21.79	27.30	21.91	35
36	28.37	22.16	28.27	22.29	28.17	22.41	28.08	22.53	36
37	29.16	22.78	29.06	22.91	28.96	23.03	28.86	23.16	37
38	29.94	23.40	29.84	23.53	29.74	23.66	29.64	23.79	38
39	30.73	24.01	30.63	24.14	30.52	24.28	30.42	24.41	39
40	31.52	24.63	31.41	24.76	31.30	24.90	31.20	25.04	40
41	32.31	25.24	32.20	25.38	32.09	25.52	31.98	25.66	41
42	33.10	25.86	32.98	26.00	32.87	26.15	32.76	26.29	42
43	33.88	26.47	33.77	26.62	33.65	26.77	33.53	26.91	43
44	34.67	27.09	34.55	27.24	34.43	27.39	34.31	27.54	44
45	35.46	27.70	35.34	27.86	35.22	28.01	35.09	28.17	45
46	36.25	28.32	36.12	28.48	36.00	28.64	35.87	28.79	46
47	37.04	28.94	36.91	29.10	36.78	29.26	36.65	29.42	47
48	37.82	29.55	37.70	29.72	37.57	29.88	37.43	30.04	48
49	38.61	30.17	38.48	30.34	38.35	30.50	38.21	30.67	49
50	39.40	30.78	39.27	30.95	39.13	31.13	38.99	31.30	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	52 Deg.		51¾ Deg.		51½ Deg.		51¼ Deg.		

Dist.	38 Deg. Lat.	Dep.	38¼ Deg. Lat.	Dep.	38½ Deg Lat.	Dep.	38¾ Deg. Lat.	Dep.	Dist.
51	40.19	31.40	40.05	31.57	39.91	31.75	39.77	31.92	51
52	40.98	32.01	40.84	32.19	40.70	32.37	40.55	32.55	52
53	41.76	32.63	41.62	32.81	41.48	32.99	41.33	33.17	53
54	42.55	33.25	42.41	33.43	42.26	33.62	42.11	33.80	54
55	43.34	33.86	43.19	34.05	43.04	34.24	42.89	34.43	55
56	44.13	34.48	43.98	34.67	43.83	34.86	43.67	35.05	56
57	44.92	35.09	44.76	35.29	44.61	35.48	44.45	35.68	57
58	45.70	35.71	45.55	35.91	45.39	36.11	45.23	36.30	58
59	46.49	36.32	46.33	36.53	46.17	36.73	46.01	36.93	59
60	47.28	36.94	47.12	37.15	46.96	37.35	46.79	37.56	60
61	48.07	37.56	47.90	37.76	47.74	37.97	47.57	38.18	61
62	48.86	38.17	48.69	38.38	48.52	38.60	48.35	38.81	62
63	49.64	38.79	49.47	39.00	49.30	39.22	49.13	39.43	63
64	50.43	39.40	50.26	39.62	50.09	39.84	49.91	40.06	64
65	51.22	40.02	51.05	40.24	50.87	40.46	50.69	40.68	65
66	52.01	40.63	51.83	40.86	51.65	41.09	51.47	41.31	66
67	52.80	41.25	52.62	41.48	52.43	41.71	52.25	41.94	67
68	53.58	41.86	53.40	42.10	53.22	42.33	53.03	42.56	68
69	54.37	42.48	54.19	42.72	54.00	42.95	53.81	43.19	69
70	55.16	43.10	54.97	43.34	54.78	43.58	54.59	43.81	70
71	55.95	43.71	55.76	43.96	55.57	44.20	55.37	44.44	71
72	56.74	44.33	56.54	44.57	56.35	44.82	56.15	45.07	72
73	57.52	44.94	57.33	45.19	57.13	45.44	56.93	45.69	73
74	58.31	45.56	58.11	45.81	57.91	46.07	57.71	46.32	74
75	59.10	46.17	58.90	46.43	58.70	46.69	58.49	46.94	75
76	59.89	46.79	59.68	47.05	59.48	47.31	59.27	47.57	76
77	60.68	47.41	60.47	47.67	60.26	47.93	60.05	48.20	77
78	61.46	48.02	61.25	48.29	61.04	48.56	60.83	48.82	78
79	62.25	48.64	62.04	48.91	61.83	49.18	61.61	49.45	79
80	63.04	49.25	62.83	49.53	62.61	49.80	62.39	50.07	80
81	63.83	49.87	63.61	50.15	63.39	50.42	63.17	50.70	81
82	64.62	50.48	64.40	50.77	64.17	51.05	63.95	51.33	82
83	65.40	51.10	65.18	51.38	64.96	51.67	64.73	51.95	83
84	66.19	51.72	65.97	52.00	65.74	52.29	65.51	52.58	84
85	66.98	52.33	66.75	52.62	66.52	52.91	66.29	53.20	85
86	67.77	52.95	67.54	53.24	67.30	53.54	67.07	53.83	86
87	68.56	53.56	68.32	53.86	68.09	54.16	67.85	54.46	87
88	69.34	54.18	69.11	54.48	68.87	54.78	68.63	55.08	88
89	70.13	54.79	69.89	55.10	69.65	55.40	69.41	55.71	89
90	70.92	55.41	70.68	55.72	70.43	56.03	70.19	56.33	90
91	71.71	56.03	71.46	56.34	71.22	56.65	70.97	56.96	91
92	72.50	56.64	72.25	56.96	72.00	57.27	71.75	57.58	92
93	73.28	57.26	73.03	57.58	72.78	57.89	72.53	58.21	93
94	74.07	57.87	73.82	58.19	73.57	58.52	73.31	58.84	94
95	74.86	58.49	74.61	58.81	74.35	59.14	74.09	59.46	95
96	75.65	59.10	75.39	59.43	75.13	59.76	74.87	60.09	96
97	76.44	59.72	76.18	60.05	75.91	60.38	75.65	60.71	97
98	77.22	60.33	76.96	60.67	76.70	61.01	76.43	61.34	98
99	78.01	60.95	77.75	61.29	77.48	61.63	77.21	61.97	99
100	78.80	61.57	78.53	61.91	78.26	62.25	77.99	62.59	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	52 Deg.		51¾ Deg.		51½ Deg.		51¼ Deg.		

Dist.	39 Deg.		39¼ Deg.		39½ Deg.		39¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.78	0.63	0.77	0.63	0.77	0.64	0.77	0.64	1
2	1.55	1.26	1.55	1.27	1.54	1.27	1.54	1.28	2
3	2.33	1.89	2.32	1.90	2.31	1.91	2.31	1.92	3
4	3.11	2.52	3.10	2.53	3.09	2.54	3.08	2.56	4
5	3.89	3.15	3.87	3.16	3.86	3.18	3.84	3.20	5
6	4.66	3.78	4.65	3.80	4.63	3.82	4.61	3.84	6
7	5.44	4.41	5.42	4.43	5.40	4.45	5.38	4.48	7
8	6.22	5.03	6.20	5.06	6.17	5.09	6.15	5.12	8
9	6.99	5.66	6.97	5.69	6.94	5.72	6.92	5.75	9
10	7.77	6.29	7.74	6.33	7.72	6.36	7.69	6.39	10
11	8.55	6.92	8.52	6.96	8.49	7.00	8.46	7.03	11
12	9.33	7.55	9.29	7.59	9.26	7.63	9.23	7.67	12
13	10.10	8.18	10.07	8.23	10.03	8.27	9.99	8.31	13
14	10.88	8.81	10.84	8.86	10.80	8.91	10.76	8.95	14
15	11.66	9.44	11.62	9.49	11.57	9.54	11.53	9.59	15
16	12.43	10.07	12.39	10.12	12.35	10.18	12.30	10.23	16
17	13.21	10.70	13.16	10.76	13.12	10.81	13.07	10.87	17
18	13.99	11.33	13.94	11.39	13.89	11.45	13.84	11.51	18
19	14.77	11.96	14.71	12.02	14.66	12.09	14.61	12.15	19
20	15.54	12.59	15.49	12.65	15.43	12.72	15.38	12.79	20
21	16.32	13.22	16.26	13.29	16.20	13.36	16.15	13.43	21
22	17.10	13.84	17.04	13.92	16.98	13.99	16.91	14.07	22
23	17.87	14.47	17.81	14.55	17.75	14.63	17.68	14.71	23
24	18.65	15.10	18.59	15.18	18.52	15.27	18.45	15.35	24
25	19.43	15.73	19.36	15.82	19.29	15.90	19.22	15.99	25
26	20.21	16.36	20.13	16.45	20.06	16.54	19.99	16.63	26
27	20.98	16.99	20.91	17.08	20.83	17.17	20.76	17.26	27
28	21.76	17.62	21.68	17.72	21.61	17.81	21.53	17.90	28
29	22.54	18.25	22.46	18.35	22.38	18.45	22.30	18.54	29
30	23.31	18.88	23.23	18.98	23.15	19.08	23.07	19.18	30
31	24.09	19.51	24.01	19.61	23.92	19.72	23.85	19.82	31
32	24.87	20.14	24.78	20.25	24.69	20.35	24.60	20.46	32
33	25.65	20.77	25.55	20.88	25.46	20.99	25.37	21.10	33
34	26.42	21.40	26.33	21.51	26.24	21.63	26.14	21.74	34
35	27.20	22.03	27.10	22.14	27.01	22.26	26.91	22.38	35
36	27.98	22.66	27.88	22.78	27.78	22.90	27.68	23.02	36
37	28.75	23.28	28.65	23.41	28.55	23.53	28.45	23.66	37
38	29.53	23.91	29.43	24.04	29.32	24.17	29.22	24.30	38
39	30.31	24.54	30.20	24.68	30.09	24.81	29.98	24.94	39
40	31.09	25.17	30.98	25.31	30.86	25.44	30.75	25.58	40
41	31.86	25.80	31.75	25.94	31.64	26.08	31.52	26.22	41
42	32.64	26.43	32.52	26.57	32.41	26.72	32.29	26.86	42
43	33.42	27.06	33.30	27.21	33.18	27.35	33.06	27.50	43
44	34.19	27.69	34.07	27.84	33.95	27.99	33.83	28.14	44
45	34.97	28.32	34.85	28.47	34.72	28.62	34.60	28.77	45
46	35.75	28.95	35.62	29.10	35.49	29.26	35.37	29.41	46
47	36.53	29.58	36.40	29.74	36.27	29.90	36.14	30.05	47
48	37.30	30.21	37.17	30.37	37.04	30.53	36.90	30.69	48
49	38.08	30.84	37.95	31.00	37.81	31.17	37.67	31.33	49
50	38.86	31.47	38.72	31.64	38.58	31.80	38.44	31.97	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		

Dist	39 Deg. Lat.	Dep.	39¼ Deg. Lat.	Dep.	39½ Deg. Lat.	Dep.	39¾ Deg. Lat.	Dep.	Dist
51	39.63	32.10	39.49	32.27	39.35	32.44	39.21	32.61	51
52	40.41	32.72	40.27	32.90	40.12	33.08	39.98	33.25	52
53	41.19	33.35	41.04	33.53	40.90	33.71	40.75	33.89	53
54	41.97	33.98	41.82	34.17	41.67	34.35	41.52	34.53	54
55	42.74	34.61	42.59	34.80	42.44	34.98	42.29	35.17	55
56	43.52	35.24	43.37	35.43	43.21	35.62	43.06	35.81	56
57	44.30	35.87	44.14	36.06	43.98	36.26	43.82	36.45	57
58	45.07	36.50	44.91	36.70	44.75	36.89	44.59	37.09	58
59	45.85	37.13	45.69	37.33	45.53	37.53	45.36	37.73	59
60	46.63	37.76	46.46	37.96	46.30	38.16	46.13	38.37	60
61	47.41	38.39	47.24	38.60	47.07	38.80	46.90	39.01	61
62	48.18	39.02	48.01	39.23	47.84	39.44	47.67	39.65	62
63	48.96	39.65	48.79	39.86	48.61	40.07	48.44	40.28	63
64	49.74	40.28	49.56	40.49	49.38	40.71	49.21	40.92	64
65	50.51	40.91	50.34	41.13	50.16	41.35	49.97	41.56	65
66	51.29	41.54	51.11	41.76	50.93	41.98	50.74	42.20	66
67	52.07	42.16	51.88	42.39	51.70	42.62	51.51	42.84	67
68	52.85	42.79	52.66	43.02	52.47	43.25	52.28	43.48	68
69	53.52	43.42	53.43	43.66	53.24	43.89	53.05	44.12	69
70	54.40	44.05	54.21	44.29	54.01	44.53	53.82	44.76	70
71	55.18	44.68	54.98	44.92	54.79	45.16	54.59	45.40	71
72	55.95	45.31	55.76	45.55	55.56	45.80	55.36	46.04	72
73	56.73	45.94	56.53	46.19	56.33	46.43	56.13	46.68	73
74	57.51	46.57	57.31	46.82	57.10	47.07	56.89	47.32	74
75	58.29	47.20	58.08	47.45	57.87	47.71	57.66	47.96	75
76	59.06	47.83	58.85	48.09	58.64	48.34	58.43	48.60	76
77	59.84	48.46	59.63	48.72	59.42	48.98	59.20	49.24	77
78	60.62	49.09	60.40	49.35	60.19	49.61	59.97	49.88	78
79	61.39	49.72	61.18	49.98	60.96	50.25	60.74	50.52	79
80	62.17	50.35	61.95	50.62	61.73	50.89	61.51	51.16	80
81	62.95	50.97	62.73	51.25	62.50	51.52	62.28	51.79	81
82	63.73	51.60	63.50	51.88	63.27	52.16	63.04	52.43	82
83	64.50	52.23	64.27	52.51	64.04	52.79	63.81	53.07	83
84	65.28	52.86	65.05	53.15	64.82	53.43	64.58	53.71	84
85	66.06	53.49	65.82	53.78	65.59	54.07	65.35	54.35	85
86	66.83	54.12	66.60	54.41	66.36	54.70	66.12	54.99	86
87	67.61	54.75	67.37	55.05	67.13	55.34	66.89	55.63	87
88	68.39	55.38	68.15	55.68	67.90	55.97	67.66	56.27	88
89	69.17	56.01	68.92	56.32	68.67	56.61	68.43	56.91	89
90	69.94	56.64	69.70	56.94	69.45	57.25	69.20	57.55	90
91	70.72	57.27	70.47	57.58	70.22	57.88	69.96	58.19	91
92	71.50	57.90	71.24	58.21	70.99	58.52	70.73	58.83	92
93	72.27	58.53	72.02	58.84	71.76	59.16	71.50	59.47	93
94	73.05	59.16	72.79	59.47	72.53	59.79	72.27	60.11	94
95	73.83	59.79	73.57	60.11	73.30	60.43	73.04	60.75	95
96	74.61	60.41	74.34	60.74	74.08	61.06	73.81	61.39	96
97	75.38	61.04	75.12	61.37	74.85	61.70	74.58	62.03	97
98	76.16	61.67	75.89	62.01	75.62	62.34	75.35	62.66	98
99	76.94	62.30	76.66	62.64	76.39	62.97	76.12	63.30	99
100	77.71	62.93	77.44	63.37	77.16	63.61	76.88	63.94	100
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	51 Deg.		50¾ Deg.		50½ Deg.		50¼ Deg.		

Dist.	40 Deg. Lat.	Dep.	40¼ Deg. Lat.	Dep.	40½ Deg. Lat.	Dep.	40¾ Deg. Lat.	Dep.	Dist.
1	0.77	0.64	0.76	0.65	0.76	0.65	0.76	0.65	1
2	1.53	1.29	1.53	1.29	1.52	1.30	1.52	1.31	2
3	2.30	1.93	2.29	1.94	2.28	1.95	2.27	1.96	3
4	3.06	2.57	3.05	2.58	3.04	2.60	3.03	2.61	4
5	3.83	3.21	3.82	3.23	3.80	3.25	3.79	3.26	5
6	4.60	3.86	4.58	3.88	4.56	3.90	4.55	3.92	6
7	5.36	4.50	5.34	4.52	5.32	4.55	5.30	4.57	7
8	6.13	5.14	6.11	5.17	6.08	5.20	6.06	5.22	8
9	6.89	5.79	6.87	5.82	6.84	5.84	6.82	5.87	9
10	7.66	6.43	7.63	6.46	7.60	6.49	7.58	6.53	10
11	8.43	7.07	8.40	7.11	8.36	7.14	8.33	7.18	11
12	9.19	7.71	9.16	7.75	9.12	7.79	9.09	7.83	12
13	9.96	8.36	9.92	8.40	9.89	8.44	9.85	8.49	13
14	10.72	9.00	10.69	9.05	10.65	9.09	10.61	9.14	14
15	11.49	9.64	11.45	9.69	11.41	9.74	11.36	9.79	15
16	12.26	10.28	12.21	10.34	12.17	10.39	12.12	10.44	16
17	13.02	10.92	12.97	10.98	12.93	11.04	12.88	11.10	17
18	13.79	11.57	13.74	11.63	13.69	11.69	13.64	11.75	18
19	14.55	12.21	14.50	12.28	14.45	12.34	14.39	12.40	19
20	15.32	12.86	15.26	12.92	15.21	12.99	15.15	13.06	20
21	16.09	13.50	16.03	13.57	15.97	13.64	15.91	13.71	21
22	16.85	14.14	16.79	14.21	16.73	14.29	16.67	14.36	22
23	17.62	14.78	17.55	14.86	17.49	14.94	17.42	15.01	23
24	18.39	15.43	18.32	15.51	18.25	15.59	18.18	15.67	24
25	19.15	16.07	19.08	16.15	19.01	16.24	18.94	16.32	25
26	19.92	16.71	19.84	16.80	19.77	16.89	19.70	16.97	26
27	20.68	17.36	20.61	17.45	20.53	17.54	20.45	17.62	27
28	21.45	18.00	21.37	18.09	21.29	18.18	21.21	18.28	28
29	22.22	18.64	22.13	18.74	22.05	18.83	21.97	18.93	29
30	22.98	19.28	22.90	19.38	22.81	19.48	22.73	19.58	30
31	23.75	19.93	23.66	20.03	23.57	20.13	23.48	20.24	31
32	24.51	20.57	24.42	20.68	24.33	20.78	24.24	20.89	32
33	25.28	21.21	25.19	21.32	25.09	21.43	25.00	21.54	33
34	26.05	21.85	25.95	21.97	25.85	22.08	25.76	22.19	34
35	26.81	22.50	26.71	22.61	26.61	22.73	26.51	22.85	35
36	27.58	23.14	27.48	23.26	27.37	23.38	27.27	23.50	36
37	28.34	23.78	28.24	23.91	28.13	24.03	28.03	24.15	37
38	29.11	24.43	29.00	24.55	28.90	24.68	28.79	24.80	38
39	29.88	25.07	29.77	25.20	29.66	25.33	29.54	25.46	39
40	30.64	25.71	30.53	25.84	30.42	25.98	30.30	26.11	40
41	31.41	26.35	31.29	26.49	31.18	26.63	31.06	26.76	41
42	32.17	27.00	32.06	27.14	31.94	27.28	31.82	27.42	42
43	32.94	27.64	32.82	27.78	32.70	27.93	32.58	28.07	43
44	33.71	28.28	33.58	28.43	33.46	28.58	33.33	28.72	44
45	34.47	28.93	34.35	29.08	34.22	29.23	34.09	29.37	45
46	35.24	29.57	35.11	29.72	34.98	29.87	34.85	30.03	46
47	36.00	30.21	35.87	30.37	35.74	30.52	35.61	30.68	47
48	36.77	30.85	36.64	31.01	36.50	31.17	36.36	31.33	48
49	37.54	31.50	37.40	31.66	37.26	31.82	37.12	31.99	49
50	38.30	32.14	38.16	32.31	38.02	32.47	37.88	32.64	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dist.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

Dist.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
51	39.07	32.78	38.92	32.95	38.78	33.12	38.64	33.29	51
52	39.83	33.42	39.69	33.60	39.54	33.77	39.39	33.94	52
53	40.60	34.07	40.45	34.24	40.30	34.42	40.15	34.60	53
54	41.37	34.71	41.21	34.89	41.06	35.07	40.91	35.25	54
55	42.13	35.35	41.98	35.54	41.82	35.72	41.67	35.90	55
56	42.90	36.00	42.74	36.18	42.58	36.37	42.42	36.55	56
57	43.66	36.64	43.50	36.83	43.34	37.02	43.18	37.21	57
58	44.43	37.28	44.27	37.48	44.10	37.67	43.94	37.86	58
59	45.20	37.92	45.03	38.12	44.86	38.32	44.70	38.51	59
60	45.96	38.57	45.79	38.77	45.62	38.97	45.45	39.17	60
61	46.73	39.21	46.56	39.41	46.38	39.62	46.21	39.82	61
62	47.49	39.85	47.32	40.06	47.15	40.27	46.97	40.47	62
63	48.26	40.50	48.08	40.71	47.91	40.92	47.73	41.12	63
64	49.03	41.14	48.85	41.35	48.67	41.56	48.49	41.78	64
65	49.79	41.78	49.61	42.00	49.43	42.21	49.24	42.43	65
66	50.56	42.42	50.37	42.64	50.19	42.86	50.00	43.08	66
67	51.32	43.07	51.14	43.29	50.95	43.51	50.76	43.73	67
68	52.09	43.71	51.90	43.94	51.71	44.16	51.51	44.39	68
69	52.86	44.35	52.66	44.58	52.47	44.81	52.27	45.04	69
70	53.62	45.00	53.43	45.23	53.23	45.46	53.03	45.69	70
71	54.39	45.64	54.19	45.87	53.99	46.11	53.79	46.35	71
72	55.15	46.28	54.95	46.52	54.75	46.76	54.54	47.00	72
73	55.92	46.92	55.72	47.17	55.51	47.41	55.30	47.65	73
74	56.69	47.57	56.48	47.81	56.27	48.06	56.06	48.30	74
75	57.45	48.21	57.24	48.46	57.03	48.71	56.82	48.96	75
76	58.22	48.85	58.01	49.11	57.79	49.36	57.57	49.61	76
77	58.99	49.49	58.77	49.75	58.55	50.01	58.33	50.26	77
78	59.75	50.14	59.53	50.40	59.31	50.66	59.09	50.92	78
79	60.52	50.78	60.30	51.04	60.07	51.31	59.85	51.57	79
80	61.28	51.42	61.06	51.69	60.83	51.96	60.61	52.22	80
81	62.05	52.07	61.82	52.34	61.59	52.61	61.36	52.87	81
82	62.82	52.71	62.59	52.98	62.35	53.25	62.12	53.53	82
83	63.58	53.35	63.35	53.63	63.11	53.90	62.88	54.18	83
84	64.35	53.99	64.11	54.27	63.87	54.55	63.64	54.83	84
85	65.11	54.64	64.87	54.92	64.63	55.20	64.39	55.48	85
86	65.88	55.28	65.64	55.57	65.39	55.85	65.15	56.14	86
87	66.65	55.92	66.40	56.21	66.16	56.50	65.91	56.79	87
88	67.41	56.57	67.16	56.86	66.92	57.15	66.67	57.44	88
89	68.18	57.21	67.93	57.50	67.68	57.80	67.42	58.10	89
90	68.94	57.85	68.69	58.15	68.44	58.45	68.18	58.75	90
91	69.71	58.49	69.43	58.80	69.20	59.10	68.94	59.40	91
92	70.48	59.14	70.22	59.44	69.96	59.75	69.70	60.05	92
93	71.24	59.78	70.98	60.09	70.72	60.40	70.45	60.71	93
94	72.01	60.42	71.74	60.74	71.48	61.05	71.21	61.36	94
95	72.77	61.06	72.51	61.38	72.24	61.70	71.97	62.01	95
96	73.54	61.71	73.27	62.03	73.00	62.35	72.73	62.66	96
97	74.31	62.35	74.03	62.67	73.76	63.00	73.48	63.32	97
98	75.07	62.99	74.80	63.32	74.52	63.65	74.24	63.97	98
99	75.84	63.64	75.56	63.97	75.28	64.30	75.00	64.62	99
100	76.60	64.28	76.32	64.61	76.04	64.94	75.76	65.28	100
Dist.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

L

Dist.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.77	0.64	0.76	0.65	0.76	0.65	0.76	0.65	1
2	1.53	1.29	1.53	1.29	1.52	1.30	1.52	1.31	2
3	2.30	1.93	2.29	1.94	2.28	1.95	2.27	1.96	3
4	3.06	2.57	3.05	2.58	3.04	2.60	3.03	2.61	4
5	3.83	3.21	3.82	3.23	3.80	3.25	3.79	3.26	5
6	4.60	3.86	4.58	3.88	4.56	3.90	4.55	3.92	6
7	5.36	4.50	5.34	4.52	5.32	4.55	5.30	4.57	7
8	6.13	5.14	6.11	5.17	6.08	5.20	6.06	5.22	8
9	6.89	5.79	6.87	5.82	6.84	5.84	6.82	5.87	9
10	7.66	6.43	7.63	6.46	7.60	6.49	7.58	6.53	10
11	8.43	7.07	8.40	7.11	8.36	7.14	8.33	7.18	11
12	9.19	7.71	9.16	7.75	9.12	7.79	9.09	7.83	12
13	9.96	8.36	9.92	8.40	9.89	8.44	9.85	8.49	13
14	10.72	9.00	10.69	9.05	10.65	9.09	10.61	9.14	14
15	11.49	9.64	11.45	9.69	11.41	9.74	11.36	9.79	15
16	12.26	10.28	12.21	10.34	12.17	10.39	12.12	10.44	16
17	13.02	10.92	12.97	10.98	12.93	11.04	12.88	11.10	17
18	13.79	11.57	13.74	11.63	13.69	11.69	13.64	11.75	18
19	14.55	12.21	14.50	12.28	14.45	12.34	14.39	12.40	19
20	15.32	12.86	15.26	12.92	15.21	12.99	15.15	13.06	20
21	16.09	13.50	16.03	13.57	15.97	13.64	15.91	13.71	21
22	16.85	14.14	16.79	14.21	16.73	14.29	16.67	14.36	22
23	17.62	14.78	17.55	14.86	17.49	14.94	17.42	15.01	23
24	18.39	15.43	18.32	15.51	18.25	15.59	18.18	15.67	24
25	19.15	16.07	19.08	16.15	19.01	16.24	18.94	16.32	25
26	19.92	16.71	19.84	16.80	19.77	16.89	19.70	16.97	26
27	20.68	17.36	20.61	17.45	20.53	17.54	20.45	17.62	27
28	21.45	18.00	21.37	18.09	21.29	18.18	21.21	18.28	28
29	22.22	18.64	22.13	18.74	22.05	18.83	21.97	18.93	29
30	22.98	19.28	22.90	19.38	22.81	19.48	22.73	19.58	30
31	23.75	19.93	23.66	20.03	23.57	20.13	23.48	20.24	31
32	24.51	20.57	24.42	20.68	24.33	20.78	24.24	20.89	32
33	25.28	21.21	25.19	21.32	25.09	21.43	25.00	21.54	33
34	26.05	21.85	25.95	21.97	25.85	22.08	25.76	22.19	34
35	26.81	22.50	26.71	22.61	26.61	22.73	26.51	22.85	35
36	27.58	23.14	27.48	23.26	27.37	23.38	27.27	23.50	36
37	28.34	23.78	28.24	23.91	28.13	24.03	28.03	24.15	37
38	29.11	24.43	29.00	24.55	28.90	24.68	28.79	24.80	38
39	29.88	25.07	29.77	25.20	29.66	25.33	29.54	25.46	39
40	30.64	25.71	30.53	25.84	30.42	25.98	30.30	26.11	40
41	31.41	26.35	31.29	26.49	31.18	26.63	31.06	26.76	41
42	32.17	27.00	32.06	27.14	31.94	27.28	31.82	27.42	42
43	32.94	27.64	32.82	27.78	32.70	27.93	32.58	28.07	43
44	33.71	28.28	33.58	28.43	33.46	28.58	33.33	28.72	44
45	34.47	28.93	34.35	29.08	34.22	29.23	34.09	29.37	45
46	35.24	29.57	35.11	29.72	34.98	29.87	34.85	30.03	46
47	36.00	30.21	35.87	30.37	35.74	30.52	35.61	30.68	47
48	36.77	30.85	36.64	31.01	36.50	31.17	36.36	31.33	48
49	37.54	31.50	37.40	31.66	37.26	31.82	37.12	31.99	49
50	38.30	32.14	38.16	32.31	38.02	32.47	37.88	32.64	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dist.
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

Dist.	40 Deg.		40¼ Deg.		40½ Deg.		40¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
51	39.07	32.78	38.92	32.95	38.78	33.12	38.64	33.29	51
52	39.83	33.42	39.69	33.60	39.54	33.77	39.39	33.94	52
53	40.60	34.07	40.45	34.24	40.30	34.42	40.15	34.60	53
54	41.37	34.71	41.21	34.89	41.06	35.07	40.91	35.25	54
55	42.13	35.35	41.98	35.54	41.82	35.72	41.67	35.90	55
56	42.90	36.00	42.74	36.18	42.58	36.37	42.42	36.55	56
57	43.66	36.64	43.50	36.83	43.34	37.02	43.18	37.21	57
58	44.43	37.28	44.27	37.48	44.10	37.67	43.94	37.86	58
59	45.20	37.92	45.03	38.12	44.86	38.32	44.70	38.51	59
60	45.96	38.57	45.79	38.77	45.62	38.97	45.45	39.17	60
61	46.73	39.21	46.56	39.41	46.38	39.62	46.21	39.82	61
62	47.49	39.85	47.32	40.06	47.15	40.27	46.97	40.47	62
63	48.26	40.50	48.08	40.71	47.91	40.92	47.73	41.12	63
64	49.03	41.14	48.85	41.35	48.67	41.56	48.48	41.78	64
65	49.79	41.78	49.61	42.00	49.43	42.21	49.24	42.43	65
66	50.56	42.42	50.37	42.64	50.19	42.86	50.00	43.08	66
67	51.32	43.07	51.14	43.29	50.95	43.51	50.76	43.73	67
68	52.09	43.71	51.90	43.94	51.71	44.16	51.51	44.39	68
69	52.86	44.35	52.66	44.58	52.47	44.81	52.27	45.04	69
70	53.62	45.00	53.43	45.23	53.23	45.46	53.03	45.69	70
71	54.39	45.64	54.19	45.87	53.99	46.11	53.79	46.35	71
72	55.16	46.28	54.95	46.52	54.75	46.76	54.54	47.00	72
73	55.92	46.92	55.72	47.17	55.51	47.41	55.30	47.65	73
74	56.69	47.57	56.48	47.81	56.27	48.06	56.06	48.30	74
75	57.45	48.21	57.24	48.46	57.03	48.71	56.82	48.96	75
76	58.22	48.85	58.01	49.11	57.79	49.36	57.57	49.61	76
77	58.99	49.49	58.77	49.75	58.55	50.01	58.33	50.26	77
78	59.75	50.14	59.53	50.40	59.31	50.66	59.09	50.92	78
79	60.52	50.78	60.30	51.04	60.07	51.31	59.85	51.57	79
80	61.28	51.42	61.06	51.69	60.83	51.96	60.61	52.22	80
81	62.05	52.07	61.82	52.34	61.59	52.61	61.36	52.87	81
82	62.82	52.71	62.59	52.98	62.35	53.25	62.12	53.53	82
83	63.58	53.35	63.35	53.63	63.11	53.90	62.88	54.18	83
84	64.35	53.99	64.11	54.27	63.87	54.55	63.64	54.83	84
85	65.11	54.64	64.87	54.92	64.63	55.20	64.39	55.48	85
86	65.88	55.28	65.64	55.57	65.39	55.85	65.15	56.14	86
87	66.65	55.92	66.40	56.21	66.16	56.50	65.91	56.79	87
88	67.41	56.57	67.16	56.86	66.92	57.15	66.67	57.44	88
89	68.18	57.21	67.93	57.50	67.68	57.80	67.42	58.10	89
90	68.94	57.85	68.69	58.15	68.44	58.45	68.18	58.75	90
91	69.71	58.49	69.45	58.80	69.20	59.10	68.94	59.40	91
92	70.48	59.14	70.22	59.44	69.96	59.75	69.70	60.05	92
93	71.24	59.78	70.98	60.09	70.72	60.40	70.45	60.71	93
94	72.01	60.42	71.74	60.74	71.48	61.05	71.21	61.36	94
95	72.77	61.06	72.51	61.38	72.24	61.70	71.97	62.01	95
96	73.54	61.71	73.27	62.03	73.00	62.35	72.73	62.66	96
97	74.31	62.35	74.03	62.67	73.76	63.00	73.48	63.32	97
98	75.07	62.99	74.80	63.32	74.52	63.65	74.24	63.97	98
99	75.84	63.64	75.56	63.97	75.28	64.30	75.00	64.62	99
100	76.60	64.28	76.32	64.61	76.04	64.94	75.76	65.28	100
Dist.	Dep.	Lar.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	50 Deg.		49¾ Deg.		49½ Deg.		49¼ Deg.		

L

Dist	41 Deg.		41¼ Deg.		41½ Deg.		41¾ Deg.		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.75	0.66	0.75	0.66	0.75	0.66	0.75	0.67	1
2	1.51	1.31	1.50	1.32	1.50	1.33	1.49	1.33	2
3	2.26	1.97	2.26	1.98	2.25	1.99	2.24	2.00	3
4	3.02	2.62	3.01	2.64	3.00	2.65	2.98	2.66	4
5	3.77	3.28	3.76	3.30	3.74	3.31	3.73	3.33	5
6	4.53	3.94	4.51	3.96	4.49	3.98	4.48	4.00	6
7	5.28	4.59	5.26	4.62	5.24	4.64	5.22	4.66	7
8	6.04	5.25	6.01	5.27	5.99	5.30	5.97	5.33	8
9	6.79	5.90	6.77	5.93	6.74	5.96	6.71	5.99	9
10	7.55	6.56	7.52	6.59	7.49	6.63	7.46	6.66	10
11	8.30	7.22	8.27	7.25	8.24	7.29	8.21	7.32	11
12	9.06	7.87	9.02	7.91	8.99	7.95	8.95	7.99	12
13	9.81	8.53	9.77	8.57	9.74	8.61	9.70	8.66	13
14	10.57	9.18	10.53	9.23	10.49	9.28	10.44	9.32	14
15	11.32	9.84	11.28	9.89	11.23	9.94	11.19	9.99	15
16	12.08	10.50	12.03	10.55	11.98	10.60	11.94	10.65	16
17	12.83	11.15	12.78	11.21	12.73	11.26	12.68	11.32	17
18	13.58	11.81	13.53	11.87	13.48	11.93	13.43	11.99	18
19	14.34	12.47	14.28	12.53	14.23	12.59	14.18	12.65	19
20	15.09	13.12	15.04	13.19	14.98	13.25	14.92	13.32	20
21	15.85	13.78	15.79	13.85	15.73	13.91	15.67	13.98	21
22	16.60	14.43	16.54	14.51	16.48	14.58	16.41	14.65	22
23	17.36	15.09	17.29	15.16	17.23	15.24	17.16	15.32	23
24	18.11	15.75	18.04	15.82	17.97	15.90	17.91	15.98	24
25	18.87	16.40	18.80	16.48	18.72	16.57	18.65	16.65	25
26	19.62	17.06	19.55	17.14	19.47	17.23	19.40	17.31	26
27	20.38	17.71	20.30	17.80	20.22	17.89	20.14	17.98	27
28	21.13	18.37	21.05	18.46	20.97	18.55	20.89	18.64	28
29	21.89	19.03	21.80	19.12	21.72	19.22	21.64	19.31	29
30	22.64	19.68	22.56	19.78	22.47	19.88	22.38	19.98	30
31	23.40	20.34	23.31	20.44	23.22	20.54	23.13	20.64	31
32	24.15	20.99	24.06	21.10	23.97	21.20	23.87	21.31	32
33	24.91	21.65	24.81	21.76	24.72	21.87	24.62	21.97	33
34	25.66	22.31	25.56	22.42	25.46	22.53	25.37	22.64	34
35	26.41	22.96	26.31	23.08	26.21	23.19	26.11	23.31	35
36	27.17	23.62	27.07	23.74	26.96	23.85	26.86	23.97	36
37	27.92	24.27	27.82	24.40	27.71	24.52	27.60	24.64	37
38	28.68	24.93	28.57	25.06	28.46	25.18	28.35	25.30	38
39	29.43	25.59	29.32	25.71	29.21	25.84	29.10	25.97	39
40	30.19	26.24	30.07	26.37	29.96	26.50	29.84	26.64	40
41	30.94	26.90	30.83	27.03	30.71	27.17	30.59	27.30	41
42	31.70	27.55	31.58	27.69	31.46	27.83	31.33	27.97	42
43	32.45	28.21	32.33	28.35	32.21	28.49	32.08	28.63	43
44	33.21	28.87	33.08	29.01	32.95	29.16	32.83	29.30	44
45	33.96	29.52	33.83	29.67	33.70	29.82	33.57	29.97	45
46	34.72	30.18	34.58	30.33	34.45	30.48	34.32	30.63	46
47	35.47	30.83	35.34	30.99	35.20	31.14	35.06	31.30	47
48	36.23	31.49	36.09	31.65	35.95	31.81	35.81	31.96	48
49	36.98	32.15	36.84	32.31	36.70	32.47	36.56	32.63	49
50	37.74	32.80	37.59	32.97	37.45	33.13	37.30	33.29	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	49 Deg.		48¾ Deg.		48½ Deg.		48¼ Deg.		

Dist.	42 Deg.		42¼ Deg.		42½ Deg		42¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	37.90	34.13	37.75	34.29	37.60	34.46	37.45	34.62	51
52	38.64	34.79	38.49	34.96	38.34	35.13	38.18	35.30	52
53	39.39	35.46	39.23	35.64	39.08	35.81	38.92	35.98	53
54	40.13	36.13	39.97	36.31	39.81	36.48	39.65	36.66	54
55	40.87	36.80	40.71	36.98	40.55	37.16	40.39	37.53	55
56	41.62	37.47	41.45	37.65	41.29	37.83	41.12	38.01	56
57	42.36	38.14	42.19	38.32	42.03	38.51	41.86	38.69	57
58	43.10	38.81	42.93	39.00	42.76	39.18	42.59	39.37	58
59	43.85	39.48	43.67	39.67	43.50	39.86	43.32	40.05	59
60	44.59	40.15	44.41	40.34	44.24	40.54	44.06	40.73	60
61	45.33	40.82	45.15	41.01	44.97	41.21	44.79	41.41	61
62	46.07	41.49	45.89	41.69	45.71	41.89	45.53	42.09	62
63	46.82	42.16	46.63	42.36	46.45	42.56	46.26	42.76	63
64	47.56	42.82	47.37	43.03	47.19	43.24	47.00	43.44	64
65	48.30	43.49	48.11	43.70	47.92	43.91	47.73	44.12	65
66	49.05	44.16	48.85	44.38	48.66	44.59	48.47	44.80	66
67	49.79	44.83	49.59	45.05	49.40	45.26	49.20	45.48	67
68	50.53	45.50	50.33	45.72	50.13	45.94	49.93	46.16	68
69	51.28	46.17	51.07	46.39	50.87	46.62	50.67	46.84	69
70	52.02	46.84	51.82	47.07	51.61	47.29	51.40	47.52	70
71	52.76	47.51	52.56	47.74	52.35	47.97	52.14	48.19	71
72	53.51	48.18	53.30	48.41	53.08	48.64	52.87	48.87	72
73	54.25	48.85	54.04	49.08	53.82	49.32	53.61	49.55	73
74	54.99	49.52	54.78	49.76	54.56	49.99	54.34	50.23	74
75	55.74	50.18	55.52	50.43	55.30	50.67	55.07	50.91	75
76	56.48	50.85	56.26	51.10	56.03	51.34	55.81	51.59	76
77	57.22	51.52	57.00	51.77	56.77	52.02	56.54	52.27	77
78	57.97	52.19	57.74	52.44	57.51	52.70	57.28	52.95	78
79	58.71	52.86	58.48	53.12	58.24	53.37	58.01	53.63	79
80	59.45	53.53	59.22	53.79	58.98	54.05	58.75	54.30	80
81	60.19	54.20	59.96	54.46	59.72	54.72	59.48	54.98	81
82	60.94	54.87	60.70	55.13	60.46	55.40	60.21	55.66	82
83	61.68	55.54	61.44	55.81	61.19	56.07	60.95	56.34	83
84	62.42	56.21	62.18	56.48	61.93	56.75	61.68	57.02	84
85	63.17	56.88	62.92	57.15	62.67	57.43	62.42	57.70	85
86	63.91	57.55	63.66	57.82	63.41	58.10	63.15	58.38	86
87	64.65	58.21	64.40	58.50	64.14	58.78	63.89	59.06	87
88	65.40	58.88	65.14	59.17	64.88	59.45	64.62	59.73	88
89	66.14	59.55	65.88	59.84	65.62	60.13	65.35	60.41	89
90	66.88	60.22	66.62	60.51	66.35	60.80	66.09	61.09	90
91	67.63	60.89	67.36	61.19	67.09	61.48	66.82	61.77	91
92	68.37	61.56	68.10	61.86	67.83	62.15	67.56	62.45	92
93	69.11	62.23	68.84	62.53	68.57	62.83	68.29	63.13	93
94	69.86	62.90	69.58	63.20	69.30	63.51	69.03	63.81	94
95	70.60	63.57	70.32	63.87	70.04	64.18	69.76	64.49	95
96	71.34	64.24	71.06	64.55	70.78	64.86	70.49	65.16	96
97	72.08	64.91	71.80	65.22	71.52	65.53	71.23	65.84	97
98	72.83	65.57	72.54	65.89	72.25	66.21	71.96	66.52	98
99	73.57	66.24	73.28	66.56	72.99	66.88	72.70	67.20	99
100	74.31	66.91	74.02	67.24	73.73	67.56	73.43	67.88	100
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	48 Deg.		47¾ Deg.		47½ Deg.		47¼ Deg.		

Dist.	42 Deg. Lat.	42 Deg. Dep.	42¼ Deg. Lat.	42¼ Deg. Dep.	42½ Deg. Lat.	42½ Deg. Dep.	42¾ Deg. Lat.	42¾ Deg. Dep.	Dist.
1	0.74	0.67	0.74	0.67	0.74	0.68	0.73	0.68	1
2	1.49	1.34	1.48	1.34	1.47	1.35	1.47	1.36	2
3	2.23	2.01	2.22	2.02	2.21	2.03	2.20	2.04	3
4	2.97	2.68	2.96	2.69	2.95	2.70	2.94	2.72	4
5	3.72	3.35	3.70	3.36	3.69	3.38	3.67	3.39	5
6	4.46	4.01	4.44	4.03	4.42	4.05	4.41	4.07	6
7	5.20	4.68	5.18	4.71	5.16	4.73	5.14	4.75	7
8	5.95	5.35	5.92	5.38	5.90	5.40	5.87	5.43	8
9	6.69	6.02	6.66	6.05	6.64	6.08	6.61	6.11	9
10	7.43	6.69	7.40	6.72	7.37	6.76	7.34	6.79	10
11	8.17	7.36	8.14	7.40	8.11	7.43	8.08	7.47	11
12	8.92	8.03	8.88	8.07	8.85	8.11	8.81	8.15	12
13	9.66	8.70	9.62	8.74	9.58	8.78	9.55	8.82	13
14	10.40	9.37	10.36	9.41	10.32	9.46	10.28	9.50	14
15	11.15	10.04	11.10	10.09	11.06	10.13	11.01	10.18	15
16	11.89	10.71	11.84	10.76	11.80	10.81	11.75	10.86	16
17	12.63	11.38	12.58	11.43	12.53	11.48	12.48	11.54	17
18	13.38	12.04	13.32	12.10	13.27	12.16	13.22	12.22	18
19	14.12	12.71	14.06	12.77	14.01	12.84	13.95	12.90	19
20	14.86	13.38	14.80	13.45	14.75	13.51	14.69	13.58	20
21	15.61	14.05	15.54	14.12	15.48	14.19	15.42	14.25	21
22	16.35	14.72	16.28	14.79	16.22	14.86	16.16	14.93	22
23	17.09	15.39	17.02	15.46	16.96	15.54	16.89	15.61	23
24	17.84	16.06	17.77	16.14	17.69	16.21	17.62	16.29	24
25	18.58	16.73	18.51	16.81	18.43	16.89	18.36	16.97	25
26	19.32	17.40	19.25	17.48	19.17	17.57	19.09	17.65	26
27	20.06	18.07	19.99	18.15	19.91	18.24	19.83	18.33	27
28	20.81	18.74	20.73	18.83	20.64	18.92	20.56	19.01	28
29	21.55	19.40	21.47	19.50	21.38	19.59	21.30	19.69	29
30	22.29	20.07	22.21	20.17	22.12	20.27	22.03	20.36	30
31	23.04	20.74	22.95	20.84	22.86	20.94	22.76	21.04	31
32	23.78	21.41	23.69	21.52	23.59	21.62	23.50	21.72	32
33	24.52	22.08	24.43	22.19	24.33	22.29	24.23	22.40	33
34	25.27	22.75	25.17	22.86	25.07	22.97	24.97	23.08	34
35	26.01	23.42	25.91	23.53	25.80	23.65	25.70	23.76	35
36	26.75	24.09	26.65	24.21	26.54	24.32	26.44	24.44	36
37	27.50	24.76	27.39	24.88	27.28	25.00	27.17	25.12	37
38	28.24	25.43	28.13	25.55	28.02	25.67	27.90	25.79	38
39	28.98	26.10	28.87	26.22	28.75	26.35	28.64	26.47	39
40	29.73	26.77	29.61	26.89	29.49	27.02	29.37	27.15	40
41	30.47	27.43	30.35	27.57	30.23	27.70	30.11	27.83	41
42	31.21	28.10	31.09	28.24	30.97	28.37	30.84	28.51	42
43	31.96	28.77	31.83	28.91	31.70	29.05	31.58	29.19	43
44	32.70	29.44	32.57	29.58	32.44	29.73	32.31	29.87	44
45	33.44	30.11	33.31	30.26	33.18	30.40	33.04	30.55	45
46	34.18	30.78	34.05	30.93	33.91	31.08	33.78	31.22	46
47	34.93	31.45	34.79	31.60	34.65	31.75	34.51	31.90	47
48	35.67	32.12	35.53	32.27	35.39	32.43	35.25	32.58	48
49	36.41	32.79	36.27	32.95	36.13	33.10	35.98	33.26	49
50	37.16	33.46	37.01	33.62	36.86	33.78	36.72	33.94	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	50 Deg.		47¾ Deg.		47½ Deg.		47¼ Deg.		

Dist.	42 Deg.		42¼ Deg.		42½ Deg		42¾ Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	37.90	34.13	37.75	34.29	37.60	34.46	37.45	34.62	51
52	38.64	34.79	38.49	34.96	38.34	35.13	38.18	35.30	52
53	39.39	35.46	39.23	35.64	39.08	35.81	38.92	35.98	53
54	40.13	36.13	39.97	36.31	39.81	36.48	39.65	36.66	54
55	40.87	36.80	40.71	36.98	40.55	37.16	40.39	37.53	55
56	41.62	37.47	41.45	37.65	41.29	37.83	41.12	38.01	56
57	42.36	38.14	42.19	38.32	42.02	38.51	41.86	38.69	57
58	43.10	38.81	42.93	39.00	42.76	39.18	42.59	39.37	58
59	43.85	39.48	43.67	39.67	43.50	39.86	43.32	40.05	59
60	44.59	40.15	44.41	40.34	44.24	40.54	44.06	40.73	60
61	45.33	40.82	45.15	41.01	44.97	41.21	44.79	41.41	61
62	46.07	41.49	45.89	41.69	45.71	41.89	45.53	42.09	62
63	46.82	42.16	46.63	42.36	46.45	42.56	46.26	42.76	63
64	47.56	42.82	47.37	43.03	47.19	43.24	47.00	43.44	64
65	48.30	43.49	48.11	43.70	47.92	43.91	47.73	44.12	65
66	49.05	44.16	48.85	44.38	48.66	44.59	48.47	44.80	66
67	49.79	44.83	49.59	45.05	49.40	45.26	49.20	45.48	67
68	50.53	45.50	50.33	45.72	50.13	45.94	49.93	46.16	68
69	51.28	46.17	51.07	46.39	50.87	46.62	50.67	46.84	69
70	52.02	46.84	51.82	47.07	51.61	47.29	51.40	47.52	70
71	52.76	47.51	52.56	47.74	52.35	47.97	52.14	48.19	71
72	53.51	48.18	53.30	48.41	53.08	48.64	52.87	48.87	72
73	54.25	48.85	54.04	49.08	53.82	49.32	53.61	49.55	73
74	54.99	49.52	54.78	49.76	54.56	49.99	54.34	50.23	74
75	55.74	50.18	55.52	50.43	55.30	50.67	55.07	50.91	75
76	56.48	50.85	56.26	51.10	56.03	51.34	55.81	51.59	76
77	57.22	51.52	57.00	51.77	56.77	52.02	56.54	52.27	77
78	57.97	52.19	57.74	52.44	57.51	52.70	57.28	52.95	78
79	58.71	52.86	58.48	53.12	58.24	53.37	58.01	53.63	79
80	59.45	53.53	59.22	53.79	58.98	54.05	58.75	54.30	80
81	60.19	54.20	59.96	54.46	59.72	54.72	59.48	54.98	81
82	60.94	54.87	60.70	55.13	60.46	55.40	60.21	55.66	82
83	61.68	55.54	61.44	55.81	61.19	56.07	60.95	56.34	83
84	62.42	56.21	62.18	56.48	61.93	56.75	61.68	57.02	84
85	63.17	56.88	62.92	57.15	62.67	57.43	62.42	57.70	85
86	63.91	57.55	63.66	57.82	63.41	58.10	63.15	58.38	86
87	64.65	58.21	64.40	58.50	64.14	58.78	63.89	59.06	87
88	65.40	58.88	65.14	59.17	64.88	59.45	64.62	59.73	88
89	66.14	59.55	65.88	59.84	65.62	60.13	65.35	60.41	89
90	66.88	60.22	66.62	60.51	66.35	60.80	66.09	61.09	90
91	67.63	60.89	67.36	61.19	67.09	61.48	66.82	61.77	91
92	68.37	61.56	68.10	61.86	67.83	62.15	67.56	62.45	92
93	69.11	62.23	68.84	62.53	68.57	62.83	68.29	63.13	93
94	69.86	62.90	69.58	63.20	69.30	63.51	69.03	63.81	94
95	70.60	63.57	70.32	63.87	70.04	64.18	69.76	64.49	95
96	71.34	64.24	71.06	64.55	70.78	64.86	70.49	65.16	96
97	72.08	64.91	71.80	65.22	71.52	65.53	71.23	65.84	97
98	72.83	65.57	72.54	65.89	72.25	66.21	71.96	66.52	98
99	73.57	66.24	73.28	66.56	72.99	66.88	72.70	67.20	99
100	74.31	66.91	74.02	67.24	73.73	67.56	73.43	67.88	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	48 Deg.		47¾ Deg.		47½ Deg.		47¼ Deg.		

Dist	43 Deg. Lat.	43 Deg. Dep.	43¼ Deg. Lat.	43¼ Deg. Dep.	43½ Deg. Lat.	43½ Deg. Dep.	43¾ Deg. Lat.	43¾ Deg. Dep.	Dist
1	0.73	0.68	0.73	0.69	0.73	0.69	0.72	0.69	1
2	1.46	1.36	1.46	1.37	1.45	1.38	1.44	1.38	2
3	2.19	2.05	2.19	2.06	2.18	2.07	2.17	2.07	3
4	2.93	2.73	2.91	2.74	2.90	2.75	2.89	2.77	4
5	3.66	3.41	3.64	3.43	3.63	3.44	3.61	3.46	5
6	4.39	4.09	4.37	4.11	4.35	4.13	4.33	4.15	6
7	5.12	4.77	5.10	4.80	5.08	4.82	5.06	4.84	7
8	5.85	5.46	5.83	5.48	5.80	5.51	5.78	5.53	8
9	6.58	6.14	6.56	6.17	6.53	6.20	6.50	6.22	9
10	7.31	6.82	7.28	6.85	7.25	6.88	7.22	6.92	10
11	8.04	7.50	8.01	7.54	7.98	7.57	7.95	7.61	11
12	8.78	8.18	8.74	8.22	8.70	8.26	8.67	8.30	12
13	9.51	8.87	9.47	8.91	9.43	8.95	9.39	8.99	13
14	10.24	9.55	10.20	9.59	10.16	9.64	10.11	9.68	14
15	10.97	10.23	10.93	10.28	10.88	10.33	10.84	10.37	15
16	11.70	10.91	11.65	10.96	11.61	11.01	11.56	11.06	16
17	12.43	11.59	12.38	11.65	12.33	11.70	12.28	11.76	17
18	13.16	12.28	13.11	12.33	13.06	12.39	13.00	12.45	18
19	13.90	12.96	13.84	13.02	13.78	13.08	13.72	13.14	19
20	14.63	13.64	14.57	13.70	14.51	13.77	14.45	13.83	20
21	15.36	14.32	15.30	14.39	15.23	14.46	15.17	14.52	21
22	16.09	15.00	16.02	15.07	15.96	15.14	15.89	15.21	22
23	16.82	15.69	16.75	15.76	16.68	15.83	16.61	15.90	23
24	17.55	16.37	17.48	16.44	17.41	16.52	17.34	16.60	24
25	18.28	17.05	18.21	17.13	18.13	17.21	18.06	17.29	25
26	19.02	17.73	18.94	17.81	18.86	17.90	18.78	17.98	26
27	19.75	18.41	19.67	18.50	19.59	18.59	19.50	18.67	27
28	20.48	19.10	20.39	19.19	20.31	19.27	20.23	19.36	28
29	21.21	19.78	21.12	19.87	21.04	19.96	20.95	20.05	29
30	21.94	20.46	21.85	20.56	21.76	20.65	21.67	20.75	30
31	22.67	21.14	22.58	21.24	22.49	21.34	22.39	21.44	31
32	23.40	21.82	23.31	21.93	23.21	22.03	23.12	22.13	32
33	24.13	22.51	24.04	22.61	23.94	22.72	23.84	22.82	33
34	24.87	23.19	24.76	23.30	24.66	23.40	24.56	23.51	34
35	25.60	23.87	25.49	23.98	25.39	24.09	25.28	24.20	35
36	26.33	24.55	26.22	24.67	26.11	24.78	26.01	24.89	36
37	27.06	25.23	26.95	25.35	26.84	25.47	26.73	25.59	37
38	27.79	25.92	27.68	26.04	27.56	26.16	27.45	26.28	38
39	28.52	26.60	28.41	26.72	28.29	26.85	28.17	26.97	39
40	29.25	27.28	29.13	27.41	29.01	27.53	28.89	27.66	40
41	29.99	27.96	29.86	28.09	29.74	28.22	29.62	28.35	41
42	30.72	28.64	30.59	28.78	30.47	28.91	30.34	29.04	42
43	31.45	29.33	31.32	29.46	31.19	29.60	31.06	29.74	43
44	32.18	30.01	32.05	30.15	31.92	30.29	31.78	30.43	44
45	32.91	30.69	32.78	30.83	32.64	30.98	32.51	31.12	45
46	33.64	31.37	33.51	31.52	33.37	31.66	33.23	31.81	46
47	34.37	32.05	34.23	32.20	34.09	32.35	33.95	32.50	47
48	35.10	32.74	34.96	32.89	34.82	33.04	34.67	33.19	48
49	35.84	33.42	35.69	33.57	35.54	33.73	35.40	33.88	49
50	36.56	34.10	36.42	34.26	36.27	34.42	36.12	34.58	50
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	47 Deg.		46¾ Deg.		46½ Deg.		46¼ Deg.		

Dist.	43 Deg. Lat.	Dep.	43¼ Deg. Lat.	Dep.	43½ Deg. Lat.	Dep.	43¾ Deg. Lat.	Dep.	Dist.
51	37.30	34.78	37.15	34.94	36.99	35.11	36.84	35.27	51
52	38.03	35.46	37.88	35.63	37.72	35.79	37.56	35.96	52
53	38.76	36.15	38.60	36.31	38.44	36.48	38.29	36.65	53
54	39.49	36.83	39.33	37.00	39.17	37.17	39.01	37.34	54
55	40.22	37.51	40.06	37.69	39.90	37.86	39.73	38.03	55
56	40.96	38.19	40.79	38.37	40.62	38.55	40.45	38.72	56
57	41.69	38.87	41.52	39.06	41.35	39.24	41.17	39.42	57
58	42.42	39.56	42.25	39.74	42.07	39.92	41.90	40.11	58
59	43.15	40.24	42.97	40.43	42.80	40.61	42.62	40.80	59
60	43.88	40.92	43.70	41.11	43.52	41.30	43.34	41.49	60
61	44.61	41.60	44.43	41.80	44.25	41.99	44.06	42.18	61
62	45.34	42.28	45.16	42.48	44.97	42.68	44.79	42.87	62
63	46.08	42.97	45.89	43.17	45.70	43.37	45.51	43.57	63
64	46.81	43.65	46.62	43.85	46.42	44.05	46.23	44.26	64
65	47.54	44.33	47.34	44.54	47.15	44.74	46.95	44.95	65
66	48.27	45.01	48.07	45.22	47.87	45.43	47.68	45.64	66
67	49.00	45.69	48.80	45.91	48.60	46.12	48.40	46.33	67
68	49.73	46.38	49.53	46.59	49.33	46.81	49.12	47.01	68
69	50.46	47.06	50.26	47.28	50.05	47.50	49.84	47.71	69
70	51.19	47.74	50.99	47.96	50.78	48.18	50.57	48.41	70
71	51.93	48.42	51.71	48.65	51.50	48.87	51.29	49.10	71
72	52.66	49.10	52.44	49.33	52.23	49.56	52.01	49.79	72
73	53.39	49.79	53.17	50.02	52.95	50.25	52.73	50.48	73
74	54.12	50.47	53.90	50.70	53.68	50.94	53.45	51.17	74
75	54.85	51.15	54.63	51.39	54.40	51.63	54.18	51.86	75
76	55.58	51.83	55.36	52.07	55.13	52.31	54.90	52.55	76
77	56.31	52.51	56.08	52.76	55.85	53.00	55.62	53.25	77
78	57.05	53.20	56.81	53.44	56.58	53.69	56.34	53.94	78
79	57.78	53.88	57.54	54.13	57.30	54.38	57.07	54.63	79
80	58.51	54.56	58.27	54.81	58.03	55.07	57.79	55.32	80
81	59.24	55.24	59.00	55.50	58.76	55.76	58.51	56.01	81
82	59.97	55.92	59.73	56.18	59.48	56.45	59.23	56.70	82
83	60.70	56.61	60.45	56.87	60.21	57.13	59.96	57.40	83
84	61.43	57.29	61.18	57.56	60.93	57.82	60.68	58.09	84
85	62.17	57.97	61.91	58.24	61.66	58.51	61.40	58.78	85
86	62.90	58.65	62.64	58.93	62.38	59.20	62.12	59.47	86
87	63.63	59.33	63.37	59.61	63.11	59.89	62.85	60.16	87
88	64.36	60.02	64.10	60.30	63.83	60.58	63.57	60.85	88
89	65.09	60.70	64.82	60.98	64.56	61.26	64.29	61.54	89
90	65.82	61.38	65.55	61.67	65.28	61.95	65.01	62.24	90
91	66.55	62.06	66.28	62.35	66.01	62.64	65.74	62.93	91
92	67.28	62.74	67.01	63.04	66.73	63.33	66.46	63.62	92
93	68.02	63.43	67.74	63.72	67.46	64.02	67.18	64.31	93
94	68.75	64.11	68.47	64.41	68.19	64.71	67.90	65.00	94
95	69.48	64.79	69.20	65.09	68.91	65.39	68.62	65.69	95
96	70.21	65.47	69.92	65.78	69.64	66.08	69.35	66.39	96
97	70.94	66.15	70.65	66.46	70.36	66.77	70.07	67.08	97
98	71.67	66.84	71.38	67.15	71.09	67.46	70.79	67.77	98
99	72.40	67.52	72.11	67.83	71.81	68.15	71.51	68.46	99
100	73.14	68.20	72.84	68.52	72.54	68.84	72.24	69.15	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	47 Deg.		46¾ Deg.		46½ Deg.		46¼ Deg.		

Dist.	44 Deg. Lat.	44 Deg. Dep.	44¼ Deg. Lat.	44¼ Deg. Dep.	44½ Deg. Lat.	44½ Deg. Dep.	44¾ Deg. Lat.	44¾ Deg. Dep.	45 Deg. Lat.	45 Deg. Dep.	Dist.
1	0.72	0.69	0.72	0.70	0.71	0.70	0.71	0.71	0.71	0.71	1
2	1.44	1.39	1.43	1.40	1.43	1.40	1.42	1.41	1.41	1.41	2
3	2.16	2.08	2.15	2.09	2.14	2.10	2.13	2.11	2.12	2.12	3
4	2.88	2.78	2.87	2.79	2.85	2.80	2.84	2.82	2.83	2.83	4
5	3.60	3.47	3.58	3.49	3.57	3.50	3.55	3.52	3.54	3.54	5
6	4.32	4.17	4.30	4.19	4.28	4.21	4.26	4.22	4.24	4.24	6
7	5.04	4.86	5.01	4.88	4.99	4.91	4.97	4.93	4.95	4.95	7
8	5.75	5.56	5.73	5.58	5.71	5.61	5.68	5.63	5.66	5.66	8
9	6.47	6.25	6.45	6.28	6.42	6.31	6.39	6.34	6.36	6.36	9
10	7.19	6.95	7.16	6.98	7.13	7.01	7.10	7.04	7.07	7.07	10
11	7.91	7.64	7.88	7.68	7.85	7.71	7.81	7.74	7.78	7.78	11
12	8.63	8.34	8.60	8.37	8.56	8.41	8.52	8.45	8.49	8.49	12
13	9.35	9.03	9.31	9.07	9.27	9.11	9.23	9.15	9.19	9.19	13
14	10.07	9.73	10.03	9.77	9.99	9.81	9.94	9.86	9.90	9.90	14
15	10.79	10.42	10.74	10.47	10.70	10.51	10.65	10.56	10.61	10.61	15
16	11.51	11.11	11.46	11.16	11.41	11.21	11.36	11.26	11.31	11.31	16
17	12.23	11.81	12.18	11.86	12.13	11.92	12.07	11.97	12.02	12.02	17
18	12.95	12.50	12.89	12.56	12.84	12.62	12.78	12.67	12.73	12.73	18
19	13.67	13.20	13.61	13.26	13.55	13.32	13.49	13.38	13.43	13.43	19
20	14.39	13.89	14.33	13.96	14.26	14.02	14.20	14.08	14.14	14.14	20
21	15.11	14.59	15.04	14.65	14.98	14.72	14.91	14.78	14.85	14.85	21
22	15.83	15.28	15.76	15.35	15.69	15.42	15.62	15.49	15.56	15.56	22
23	16.54	15.98	16.47	16.05	16.40	16.12	16.33	16.19	16.26	16.26	23
24	17.26	16.67	17.19	16.75	17.12	16.82	17.04	16.90	16.97	16.97	24
25	17.98	17.37	17.91	17.44	17.83	17.52	17.75	17.60	17.68	17.68	25
26	18.70	18.06	18.62	18.14	18.54	18.22	18.46	18.30	18.38	18.38	26
27	19.42	18.76	19.34	18.84	19.26	18.92	19.17	19.01	19.09	19.09	27
28	20.14	19.45	20.06	19.54	19.97	19.63	19.89	19.71	19.80	19.80	28
29	20.86	20.15	20.77	20.24	20.68	20.33	20.60	20.42	20.51	20.51	29
30	21.58	20.84	21.49	20.93	21.40	21.03	21.31	21.12	21.21	21.21	30
31	22.30	21.53	22.21	21.63	22.11	21.73	22.02	21.82	21.92	21.92	31
32	23.02	22.23	22.92	22.33	22.82	22.43	22.73	22.53	22.63	22.63	32
33	23.74	22.92	23.64	23.03	23.54	23.13	23.44	23.23	23.33	23.33	33
34	24.46	23.62	24.35	23.72	24.25	23.83	24.15	23.94	24.04	24.04	34
35	25.18	24.31	25.07	24.42	24.96	24.53	24.86	24.64	24.75	24.75	35
36	25.90	25.01	25.79	25.12	25.68	25.23	25.57	25.34	25.46	25.46	36
37	26.62	25.70	26.50	25.82	26.39	25.93	26.28	26.05	26.16	26.16	37
38	27.33	26.40	27.22	26.52	27.10	26.63	26.99	26.75	26.87	26.87	38
39	28.05	27.09	27.94	27.21	27.82	27.34	27.70	27.46	27.58	27.58	39
40	28.77	27.79	28.65	27.91	28.53	28.04	28.41	28.16	28.28	28.28	40
41	29.49	28.48	29.37	28.61	29.24	28.74	29.12	28.86	28.99	28.99	41
42	30.21	29.18	30.08	29.31	29.96	29.44	29.83	29.57	29.70	29.70	42
43	30.93	29.87	30.80	30.00	30.67	30.14	30.54	30.27	30.41	30.41	43
44	31.65	30.56	31.52	30.70	31.38	30.84	31.25	30.98	31.11	31.11	44
45	32.37	31.26	32.23	31.40	32.10	31.54	31.96	31.68	31.82	31.82	45
46	33.09	31.95	32.95	32.10	32.81	32.24	32.67	32.38	32.53	32.53	46
47	33.81	32.65	33.67	32.80	33.52	32.94	33.38	33.09	33.23	33.23	47
48	34.53	33.34	34.38	33.49	34.24	33.64	34.09	33.79	33.94	33.94	48
49	35.25	34.04	35.10	34.19	34.95	34.34	34.80	34.50	34.65	34.65	49
50	35.97	34.73	35.82	34.89	35.66	35.05	35.51	35.20	35.36	35.36	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	46 Deg.		45¾ Deg.		45½ Deg.		45¼ Deg.		45 Deg.		

Dist.	44 Deg. Lat.	Dep.	44¼ Deg. Lat.	Dep.	44½ Deg. Lat.	Dep.	44¾ Deg. Lat.	Dep.	45 Deg. Lat.	Dep.	Dist.
51	36.69	35.43	36.53	35.59	36.38	35.75	36.22	35.90	36.06	36.06	51
52	37.41	36.12	37.25	36.29	37.09	36.45	36.93	36.61	36.77	36.77	52
53	38.12	36.82	37.96	36.98	37.80	37.15	37.64	37.31	37.48	37.48	53
54	38.84	37.51	38.68	37.68	38.52	37.85	38.35	38.02	38.18	38.18	54
55	39.56	38.21	39.40	38.38	39.23	38.55	39.06	38.72	38.89	38.89	55
56	40.28	38.90	40.11	39.08	39.94	39.25	39.77	39.42	39.60	39.60	56
57	41.00	39.60	40.83	39.77	40.66	39.95	40.48	40.13	40.31	40.31	57
58	41.72	40.29	41.55	40.47	41.37	40.65	41.19	40.83	41.01	41.01	58
59	42.44	40.98	42.26	41.17	42.08	41.35	41.90	41.54	41.72	41.72	59
60	43.16	41.68	42.98	41.87	42.79	42.05	42.61	42.24	42.43	42.43	60
61	43.88	42.37	43.69	42.57	43.51	42.76	43.32	42.94	43.13	43.13	61
62	44.60	43.07	44.41	43.26	44.22	43.46	44.03	43.65	43.84	43.84	62
63	45.32	43.76	45.13	43.96	44.93	44.16	44.74	44.35	44.55	44.55	63
64	46.04	44.46	45.84	44.66	45.65	44.86	45.45	45.06	45.25	45.25	64
65	46.76	45.15	46.56	45.36	56.36	45.56	46.16	45.76	45.96	45.96	65
66	47.48	45.85	47.28	46.05	47.07	46.26	46.87	46.47	46.67	46.67	66
67	48.29	46.54	47.99	46.75	47.79	46.96	47.58	47.17	47.38	47.38	67
68	48.92	47.24	48.71	47.45	48.50	47.66	48.29	47.87	48.08	48.08	68
69	49.63	47.93	49.42	48.15	49.21	48.36	49.00	48.58	48.79	48.79	69
70	50.35	48.63	50.14	48.85	49.93	49.06	49.71	49.28	49.50	49.50	70
71	51.07	49.32	50.86	49.54	50.64	49.76	50.42	49.99	50.20	50.20	71
72	51.79	50.02	51.57	50.24	51.35	50.47	51.13	50.69	50.91	50.91	72
73	52.51	50.71	52.29	50.94	52.07	51.17	51.84	51.39	51.62	51.62	73
74	53.23	51.40	53.01	51.64	52.78	51.87	52.55	52.10	52.33	52.33	74
75	53.95	52.10	53.72	52.33	53.49	52.57	53.26	52.80	53.03	53.03	75
76	54.67	52.79	54.44	53.03	54.21	53.27	53.97	53.51	53.74	53.74	76
77	55.39	53.49	55.16	53.73	54.92	53.97	54.68	54.21	54.45	54.45	77
78	56.11	54.18	55.87	54.43	55.63	54.67	55.39	54.91	55.15	55.15	78
79	56.83	54.88	56.59	55.13	56.35	55.37	56.10	55.62	55.86	55.86	79
80	57.55	55.57	57.30	55.82	57.06	56.07	56.81	56.32	56.57	56.57	80
81	58.27	56.27	58.02	56.52	57.77	56.77	57.52	57.03	57.28	57.28	81
82	58.99	56.96	58.74	57.22	58.49	57.47	58.24	57.73	57.98	57.98	82
83	59.71	57.66	59.45	57.92	59.20	58.18	58.95	58.43	58.69	58.69	83
84	60.42	58.35	60.17	58.61	59.91	58.88	59.66	59.14	59.40	59.40	84
85	61.14	59.05	60.89	59.31	60.63	59.58	60.37	59.84	60.10	60.10	85
86	61.86	59.74	61.60	60.01	61.34	60.28	61.08	60.55	60.81	60.81	86
87	62.58	60.44	62.32	60.71	62.05	60.98	61.79	61.25	61.52	61.52	87
88	63.30	61.13	63.03	61.41	62.77	61.68	62.50	61.95	62.23	62.23	88
89	64.02	61.82	63.75	62.10	63.48	62.38	63.21	62.66	62.93	62.93	89
90	64.74	62.52	64.47	62.80	64.19	63.08	63.92	63.36	63.64	63.64	90
91	65.46	63.21	65.18	63.50	64.91	63.78	64.63	64.07	64.35	64.35	91
92	66.18	63.91	65.90	64.20	65.62	64.48	65.34	64.77	65.05	65.05	92
93	66.90	64.60	66.62	64.89	66.33	65.18	66.05	65.47	65.76	65.76	93
94	67.62	65.30	67.33	65.59	67.05	65.89	66.76	66.18	66.47	66.47	94
95	68.34	65.99	68.05	66.29	67.76	66.59	67.47	66.88	67.18	67.18	95
96	69.06	66.69	68.76	66.99	68.47	67.29	68.18	67.59	67.88	67.88	96
97	69.78	67.38	69.48	67.69	69.19	67.99	68.89	68.29	68.59	68.59	97
98	70.50	68.08	70.20	68.38	69.90	68.69	69.60	68.99	69.30	69.30	98
99	71.21	68.77	70.91	69.08	70.61	69.39	70.51	69.70	70.00	70.00	99
100	71.93	69.47	71.63	69.78	71.33	70.09	71.02	70.40	70.71	70.71	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	46 Deg.		45¾ Deg.		45½ Deg.		45¼ Deg.		45 Deg.		

M

A

TABLE

OF

LOGARITHMS,

FROM 1 TO 10,000.

Note. The index of the logarithm of every integer number consisting of only one figure is 0, of two figures 1, of three figures 2, of four figures 3; being always an unit less than the number of figures contained in the integer number. In this table, as is generally the case, the index to the logarithm of every number above 100 is omitted; yet in the operation must be prefixed according to this remark; so the logarithm of 700 is 2.84510, and of 7000 is 3.84510, and so of the rest.

No	Log.	No	Log.	No	Log.	No	Log.	No	Log.
1	0.00000	21	1.32222	41	1.61278	61	1.78533	81	1.90849
2	0.30103	22	34242	42	62325	62	79239	82	91381
3	0.47712	23	36173	43	63347	63	79934	83	91908
4	0.60206	24	38021	44	64345	64	80618	84	92428
5	0.69897	25	39794	45	65321	65	81291	85	92942
6	0.77815	26	41497	46	66276	66	81954	86	93450
7	0.84510	27	43136	47	67210	67	82607	87	93952
8	0.90309	28	44716	48	68124	68	83251	88	94448
9	0.95424	29	46240	49	69020	69	83885	89	94939
10	1.00000	30	47712	50	69897	70	84510	90	95424
11	1.04139	31	1.49136	51	1.70757	71	1.85126	91	1.95904
12	07918	32	50515	52	71600	72	85733	92	96379
13	11394	33	51851	53	72428	73	86332	93	96848
14	14613	34	53148	54	73239	74	86923	94	97313
15	17609	35	54407	55	74036	75	87506	95	97772
16	20412	36	55630	56	74819	76	88081	96	98227
17	23045	37	56820	57	75587	77	88649	97	98677
18	25527	38	57978	58	76343	78	89209	98	99123
19	27875	39	59106	59	77085	79	89763	99	99564
20	30103	40	60206	60	77815	80	90309	100	2.00000

No	0	1	2	3	4	5	6	7	8	9
100	00000	00043	00087	00130	00173	00217	00260	00303	00346	00389
101	00432	00475	00518	00561	00604	00647	00689	00732	00775	00817
102	00860	00903	00945	00988	01030	01072	01115	01157	01199	01242
103	01284	01326	01368	01410	01452	01494	01536	01578	01620	01661
104	01703	01745	01787	01828	01870	01912	01953	01995	02036	02077
105	02119	02166	02202	02243	02284	02325	02366	02407	02449	02490
106	02531	02572	02612	02653	02694	02735	02776	02816	02857	02898
107	02938	02979	03019	03060	03100	03141	03181	03222	03262	03302
108	03342	03383	03423	03463	03503	03543	03583	03623	03663	03703
109	03743	03782	03822	03862	03902	03941	03981	04021	04060	04100
110	04139	04179	04218	04257	04297	04336	04375	04415	04454	04493
111	04532	04571	04610	04649	04688	04727	04766	04805	04844	04883
112	04922	04961	04999	05038	05077	05115	05154	05192	05231	05269
113	05308	05346	05385	05423	05461	05500	05538	05576	05614	05652
114	05690	05729	05767	05805	05843	05880	05918	05956	05994	06032
115	06070	06108	06145	06183	06221	06258	06296	06333	06371	06408
116	06446	06483	06521	06558	06595	06633	06670	06707	06744	06781
117	06819	06856	06893	06930	06967	07004	07041	07078	07114	07151
118	07188	07225	07262	07298	07335	07372	07408	07445	07482	07518
119	07555	07591	07628	07664	07700	07737	07773	07809	07846	07882
120	07918	07954	07990	08027	08063	08099	08135	08171	08207	08243
121	08279	08314	08350	08386	08422	08458	08493	08529	08565	08600
122	08636	08672	08707	08743	08778	08814	08849	08884	08920	08955
123	08991	09026	09061	09097	09131	09167	09202	09237	09272	09307
124	09342	09377	09412	09447	09482	09517	09552	09587	09621	09656
125	09691	09726	09760	09795	09830	09864	09899	09933	09968	10003
126	10037	10071	10106	10140	10175	10209	10243	10278	10312	10346
127	10380	10414	10449	10483	10517	10551	10585	10619	10653	10687
128	10721	10755	10789	10823	10856	10890	10924	10958	10992	11025
129	11059	11093	11126	11160	11193	11227	11260	11294	11327	11361
130	11394	11428	11461	11494	11528	11561	11594	11628	11661	11694
131	11727	11760	11793	11826	11860	11893	11926	11959	11991	12024
132	12057	12090	12123	12156	12189	12222	12254	12287	12320	12352
133	12385	12418	12450	12483	12516	12548	12581	12613	12646	12678
134	12710	12743	12775	12808	12840	12872	12904	12937	12969	13001
135	13033	13065	13098	13130	13162	13194	13226	13258	13290	13322
136	13354	13386	13418	13450	13481	13513	13545	13577	13609	13640
137	13672	13704	13735	13767	13799	13830	13862	13893	13925	13956
138	13988	14019	14051	14082	14114	14145	14176	14208	14239	14270
139	14301	14333	14364	14395	14426	14457	14488	14520	14551	14582
140	14613	14644	14675	14706	14737	14768	14798	14829	14860	14891
141	14922	14953	14983	15014	15045	15076	15106	15137	15168	15198
142	15229	15259	15290	15320	15351	15381	15412	15442	15473	15503
143	15534	15564	15594	15625	15655	15685	15715	15746	15776	15806
144	15836	15866	15896	15927	15957	15987	16017	16047	16077	16107
145	16137	16167	16197	16227	16256	16286	16316	16346	16376	16405
146	16435	16465	16495	16524	16554	16584	16613	16643	16673	16702
147	16732	16761	16791	16820	16850	16879	16909	16938	16967	16997
148	17026	17055	17085	17114	17143	17173	17202	17231	17260	17289
149	17319	17348	17377	17406	17435	17464	17493	17522	17551	17580
150	17609	17638	17667	17696	17725	17754	17782	17811	17840	17869
151	17898	17926	17955	17984	18013	18041	18070	18099	18127	18156
152	18184	18213	18241	18270	18298	18327	18355	18384	18412	18441
153	18469	18497	18526	18554	18583	18611	18639	18667	18696	18724
154	18752	18780	18808	18837	18865	18893	18921	18949	18977	19005
155	19033	19061	19089	19117	19145	19173	19201	19229	19257	19285
156	19312	19340	19368	19396	19424	19451	19479	19507	19535	19563
157	19590	19618	19645	19673	19700	19728	19756	19783	19811	19838
158	19866	19893	19921	19948	19975	20003	20030	20058	20085	20112
159	20140	20167	20194	20222	20249	20276	20303	20330	20358	20385

No	0	1	2	3	4	5	6	7	8	9
280	44716	44731	44747	44762	44778	44793	44809	44824	44840	44855
281	44871	44886	44901	44917	44932	44948	44963	44979	44994	45009
282	45025	45040	45056	45071	45086	45102	45117	45133	45148	45163
283	45179	45194	45209	45225	45240	45255	45271	45286	45301	45316
284	45332	45347	45362	45378	45393	45408	45423	45439	45454	45469
285	45484	45500	45515	45530	45545	45561	45576	45591	45606	45621
286	45637	45652	45667	45682	45697	45712	45728	45743	45758	45773
287	45788	45803	45818	45834	45849	45864	45879	45894	45909	45924
288	45939	45954	45969	45984	46000	46015	46030	46045	46060	46075
289	46090	46105	46120	46135	46150	46165	46180	46195	46210	46225
290	46240	46255	46270	46285	46300	46315	46330	46344	46359	46374
291	46389	46404	46419	46434	46449	46464	46479	46494	46508	46523
292	46538	46553	46568	46583	46598	46613	46627	46642	46657	46672
293	46687	46702	46716	46731	46746	46761	46776	46790	46805	46820
294	46835	46849	46864	46879	46894	46908	46923	46938	46953	46967
295	46982	46997	47012	47026	47041	47056	47070	47085	47100	47114
296	47129	47144	47158	47173	47188	47202	47217	47232	47246	47261
297	47276	47290	47305	47319	47334	47349	47363	47378	47392	47407
298	47422	47436	47451	47465	47480	47494	47510	47523	47538	47553
299	47567	47582	47596	47611	47625	47640	47654	47669	47683	47698
300	47712	47727	47741	47755	47770	47784	47799	47813	47828	47842
301	47857	47871	47885	47900	47914	47929	47943	47957	47972	47986
302	48001	48015	48029	48044	48058	48072	48087	48101	48116	48130
303	48144	48159	48173	48187	48202	48216	48230	48244	48259	48273
304	48287	48302	48316	48330	48344	48359	48373	48387	48401	48416
305	48430	48444	48458	48473	48487	48501	48515	48529	48544	48558
306	48572	48586	48600	48615	48629	48643	48657	48671	48685	48700
307	48714	48728	48742	48756	48770	48784	48799	48813	48827	48841
308	48855	48869	48883	48897	48911	48925	48940	48954	48968	48982
309	48996	49010	49024	49038	49052	49066	49080	49094	49108	49122
310	49136	49150	49164	49178	49192	49206	49220	49234	49248	49262
311	49276	49290	49304	49318	49332	49346	49360	49374	49388	49401
312	49415	49429	49443	49457	49471	49485	49499	49513	49527	49541
313	49554	49568	49582	49596	49610	49624	49638	49651	49665	49679
314	49693	49707	49721	49734	49748	49762	49776	49790	49803	49817
315	49831	49845	49859	49872	49886	49900	49914	49927	49941	49955
316	49969	49982	49996	50010	50024	50037	50051	50065	50078	50092
317	50106	50120	50133	50147	50161	50174	50188	50202	50215	50229
318	50243	50256	50270	50284	50297	50311	50325	50338	50352	50365
319	50379	50393	50406	50420	50433	50447	50461	50474	50488	50501
320	50515	50529	50542	50556	50569	50583	50596	50610	50623	50637
321	50650	50664	50678	50691	50705	50718	50732	50745	50759	50772
322	50786	50799	50813	50826	50839	50853	50866	50880	50893	50907
323	50920	50934	50947	50961	50974	50987	51001	51014	51028	51041
324	51054	51068	51081	51095	51108	51121	51135	51148	51162	51175
325	51188	51202	51215	51228	51242	51255	51268	51282	51295	51308
326	51322	51335	51348	51362	51375	51388	51402	51415	51428	51441
327	51455	51468	51481	51495	51508	51521	51534	51548	51561	51574
328	51587	51601	51614	51627	51640	51653	51667	51680	51693	51706
329	51720	51733	51746	51759	51772	51785	51799	51812	51825	51838
330	51851	51865	51878	51891	51904	51917	51930	51943	51956	51970
331	51983	51996	52009	52022	52035	52048	52061	52074	52088	52101
332	52114	52127	52140	52153	52166	52179	52192	52205	52218	52231
333	52244	52257	52270	52283	52297	52310	52323	52336	52349	52362
334	52375	52388	52401	52414	52427	52440	52453	52466	52478	52491
335	52504	52517	52530	52543	52556	52569	52582	52595	52608	52621
336	52634	52647	52660	52672	52686	52698	52711	52724	52737	52750
337	52763	52776	52789	52802	52814	52827	52840	52852	52866	52879
338	52892	52904	52917	52930	52943	52956	52969	52981	52994	53007
339	53020	53033	53046	53058	53071	53084	53097	53110	53122	53135

No	0	1	2	3	4	5	6	7	8	9
340	53148	53161	53173	53186	53199	53212	53224	53237	53250	53263
341	53275	53288	53301	53314	53326	53339	53352	53364	53377	53390
342	53403	53415	53428	53441	53453	53466	53479	53491	53504	53517
343	53529	53542	53555	53567	53580	53593	53605	53618	53631	53643
344	53656	53668	53681	53694	53706	53719	53731	53744	53757	53769
345	53782	53794	53807	53820	53832	53845	53857	53870	53882	53895
346	53908	53920	53933	53945	53958	53970	53983	53995	54008	54020
347	54033	54045	54058	54070	54083	54095	54108	54120	54133	54145
348	54158	54170	54183	54195	54208	54220	54233	54245	54258	54270
349	54282	54295	54307	54320	54332	54345	54357	54370	54382	54394
350	54407	54419	54432	54444	54456	54469	54481	54494	54506	54518
351	54531	54543	54555	54568	54580	54592	54605	54617	54630	54642
352	54654	54667	54679	54691	54704	54716	54728	54740	54753	54765
353	54777	54790	54802	54814	54827	54839	54851	54863	54876	54888
354	54900	54913	54925	54937	54949	54962	54974	54986	54998	55011
355	55023	55035	55047	55059	55072	55084	55096	55108	55121	55133
356	55145	55157	55169	55182	55194	55206	55218	55230	55242	55255
357	55267	55279	55291	55303	55315	55328	55340	55352	55364	55376
358	55387	55400	55413	55425	55437	55449	55461	55473	55485	55497
359	55509	55521	55534	55546	55558	55570	55582	55594	55606	55618
360	55630	55642	55654	55666	55678	55690	55703	55715	55727	55739
361	55751	55763	55775	55787	55799	55811	55823	55835	55847	55859
362	55871	55883	55895	55907	55919	55931	55943	55955	55967	55979
363	55991	56003	56015	56026	56038	56050	56062	56074	56086	56098
364	56110	56122	56134	56146	56158	56170	56182	56194	56205	56217
365	56229	56241	56253	56265	56277	56289	56301	56312	56324	56336
366	56348	56360	56372	56384	56395	56407	56419	56431	56443	56455
367	56467	56478	56490	56502	56514	56526	56538	56549	56561	56573
368	56585	56597	56608	56620	56632	56644	56656	56667	56679	56691
369	56703	56714	56726	56738	56750	56761	56773	56785	56797	56808
370	56820	56833	56844	56855	56867	56879	56890	56902	56914	56926
371	56937	56949	56961	56972	56984	56996	57008	57019	57031	57043
372	57054	57066	57078	57089	57101	57113	57124	57136	57148	57159
373	57171	57183	57194	57206	57217	57229	57241	57252	57264	57276
374	57287	57299	57310	57322	57334	57345	57357	57368	57380	57391
375	57403	57415	57426	57438	57449	57461	57473	57484	57496	57507
376	57519	57530	57542	57553	57565	57576	57588	57600	57611	57623
377	57634	57646	57657	57669	57680	57692	57703	57715	57726	57738
378	57749	57761	57772	57784	57795	57807	57818	57829	57841	57852
379	57864	57875	57887	57898	57910	57921	57933	57944	57955	57967
380	57978	57990	58001	58013	58024	58035	58047	58058	58070	58081
381	58092	58104	58115	58127	58138	58149	58161	58172	58184	58195
382	58206	58218	58229	58240	58252	58263	58274	58286	58297	58308
383	58320	58331	58343	58354	58365	58376	58388	58399	58410	58422
384	58433	58444	58456	58467	58478	58490	58501	58512	58523	58535
385	58546	58557	58569	58580	58591	58602	58614	58625	58636	58647
386	58659	58670	58681	58692	58704	58715	58726	58737	58749	58760
387	58771	58782	58793	58805	58816	58827	58838	58850	58861	58872
388	58883	58894	58906	58917	58928	58939	58950	58961	58973	58984
389	58995	59006	59017	59028	59040	59051	59062	59073	59084	59095
390	59106	59118	59129	59140	59151	59162	59173	59184	59195	59207
391	59218	59229	59240	59251	59262	59273	59284	59295	59306	59317
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393	59439	59450	59461	59472	59483	59494	59506	59516	59528	59539
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848	92840	92845	92850	92855	92860	92865	92870	92875	92881	92886
849	92891	92896	92901	92906	92911	92916	92921	92927	92932	92937
850	92942	92947	92952	92957	92962	92967	92973	92978	92983	92988
851	92993	92998	93003	93008	93013	93018	93024	93029	93034	93039
852	93044	93049	93054	93059	93064	93069	93075	93080	93085	93090
853	93095	93100	93105	93110	93115	93120	93125	93131	93136	93141
854	93146	93151	93156	93161	93166	93171	93176	93181	93186	93192
855	93197	93202	93207	93212	93217	93222	93227	93232	93237	93242
856	93247	93253	93258	93263	93268	93273	93278	93283	93288	93293
857	93298	93303	93308	93313	93318	93323	93328	93334	93339	93344
858	93349	93354	93359	93364	93369	93374	93379	93384	93382	93394
859	93399	93404	93409	93414	93420	93425	93430	93435	93440	93445
860	93450	93455	93460	93465	93470	93475	93480	93485	93490	93494
861	93500	93505	93510	93515	93520	93526	93531	93536	93541	93546
862	93551	93556	93561	93566	93571	93576	93581	93586	93591	93596
863	93601	93606	93611	93616	93621	93626	93631	93636	93641	93646
864	93651	93656	93661	93666	93671	93676	93682	93687	93692	93697
865	93702	93707	93712	93717	93722	93727	93732	93737	93742	93747
866	93752	93757	93762	93767	93772	93777	93782	93787	93792	93797
867	93802	93807	93812	93817	93822	93827	93832	93837	93842	93847
868	93852	93857	93862	93867	93872	93877	93882	93887	93892	93897
869	93902	93907	93912	93917	93922	93927	93932	93937	93942	93947
870	93952	93957	93962	93967	93972	93977	93982	93987	93992	93997
871	94002	94007	94012	94017	94022	94027	94032	94037	94042	94047
872	94052	94057	94062	94067	94072	94077	94082	94086	94091	94096
873	94101	94106	94111	94116	94121	94126	94131	94136	94141	94146
874	94151	94156	94161	94166	94171	94176	94181	94186	94191	94196
875	94201	94206	94211	94216	94221	94226	94231	94236	94240	94245
876	94250	94255	94260	94265	94270	94275	94280	94285	94290	94295
877	94300	94305	94310	94315	94320	94325	94330	94335	94340	94345
878	94349	94354	94359	94364	94369	94374	94379	94384	94389	94394
879	94399	94404	94409	94414	94419	94424	94429	94433	94438	94443

M	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.23967	9.99335	9.24632	10.75368	10.00665	10.76033	60
1	24039	99333	24706	75294	00667	75961	59
2	24110	99331	24779	75221	00669	75890	58
3	24181	99328	24853	75147	00672	75819	57
4	24253	99326	24926	75074	00674	75747	56
5	24324	99324	25000	75000	00676	75676	55
6	24395	99322	25073	74927	00678	75605	54
7	24466	99319	25146	74854	00680	75534	53
8	24536	99317	25219	74781	00683	75464	52
9	24607	99315	25292	74708	00685	75393	51
10	9.24677	9.99313	9.25365	10.74635	10.00687	10.75325	50
11	24748	99310	25437	74563	00690	75252	49
12	24818	99308	25510	74490	00692	75182	48
13	24888	99306	25582	74418	00694	75112	47
14	24958	99304	25655	74345	00696	75042	46
15	25028	99301	25727	74273	00699	74972	45
16	25098	99299	25799	74201	00701	74902	44
17	25168	99297	25871	74129	00703	74832	43
18	25237	99294	25943	74057	00706	74762	42
19	25307	99292	26015	73985	00708	74693	41
20	9.25376	9.99290	9.26086	10.73914	10.00710	10.74623	40
21	25445	99288	26158	73842	00712	74555	39
22	25514	99285	26229	73771	00715	74486	38
23	25583	99283	26301	73699	00717	74417	37
24	25652	99281	26372	73628	00719	74348	36
25	25721	99278	26443	73557	00722	74279	35
26	25790	99276	26514	73486	00724	74210	34
27	25858	99274	26585	73415	00726	74142	33
28	25927	99271	26655	73344	00729	74073	32
29	25995	99269	26726	73274	00731	74005	31
30	9.26063	9.99267	9.26797	10.73203	10.00733	10.73937	30
31	26131	99264	26867	73133	00736	73869	29
32	26199	99262	26937	73063	00738	73801	28
33	26267	99260	27008	72992	00741	73733	27
34	26935	99257	27078	72922	00743	73665	26
35	26403	99255	27148	72852	00745	73597	25
36	26470	99252	27218	72782	00747	73530	24
37	26538	99250	27288	72712	00750	73462	23
38	26605	99248	27357	72643	00752	73395	22
39	26672	99245	27427	72573	00755	73328	21
40	9.26739	9.99243	9.27496	10.72504	10.00757	10.73261	20
41	26806	99241	27566	72434	00759	73193	19
42	26873	99238	27635	72365	00762	73127	18
43	26940	99236	27704	72296	00764	73060	17
44	27007	99233	27773	72227	00766	72993	16
45	27073	99231	27842	72158	00769	72927	15
46	27140	99229	27911	72089	00771	72860	14
47	27206	99226	27980	72020	00774	72794	13
48	27273	99224	28049	71951	00776	72727	12
49	27339	99221	28117	71883	00779	72661	11
50	9.27405	9.99219	9.28186	10.71814	10.00781	10.72595	10
51	27471	99217	28254	71746	00783	72529	9
52	27537	99214	28323	71677	00786	72463	8
53	27602	99212	28391	71609	00788	72398	7
54	27668	99209	28459	71541	00791	72332	6
55	27734	99207	28527	71473	00793	72266	5
56	27799	99204	28595	71405	00796	72201	4
57	27864	99202	28662	71338	00798	72136	3
58	27930	99200	28730	71270	00800	72070	2
59	27995	99197	28798	71202	00803	72005	1
60	28060	99195	28865	71135	00805	71940	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.28060	9.99195	9.28865	10.71135	10.00805	10.71940	60
1	28125	99192	28933	71067	00808	71875	59
2	28190	99190	29000	71000	00810	71810	58
3	28254	99187	29067	70933	00813	71746	57
4	28319	99185	29134	70866	00815	71681	56
5	28384	99182	29201	70799	00818	71616	55
6	28448	99180	29268	70732	00820	71552	54
7	28512	99177	29335	70665	00823	71488	53
8	28577	99175	29402	70598	00825	71423	52
9	28641	99172	29468	70532	00828	71359	51
10	9.28705	9.99170	9.29535	10.70465	10.00830	10.71295	50
11	28769	99167	29601	70399	00833	71231	49
12	28833	99165	29668	70332	00835	71167	48
13	28896	99162	29734	70266	00838	71104	47
14	28960	99160	29800	70200	00840	71040	46
15	29024	99157	29866	70134	00843	70975	45
16	29087	99155	29932	70068	00845	70913	44
17	29150	99152	29998	70002	00848	70850	43
18	29214	99150	30064	69936	00850	70786	42
19	29277	99147	30130	69870	00853	70723	41
20	9.29340	9.99145	9.30195	10.69805	10.00855	10.70660	40
21	29403	99142	30261	69739	00858	70597	39
22	29466	99140	30326	69674	00860	70534	38
23	29529	99137	30391	69609	00863	70471	37
24	29591	99135	30457	69543	00865	70409	36
25	29654	99132	30522	69478	00868	70346	35
26	29716	99130	30587	69413	00870	70284	34
27	29779	99127	30652	69348	00873	70221	33
28	29841	99124	30717	69283	00876	70159	32
29	29903	99122	30782	69218	00878	70097	31
30	9.29966	9.99119	9.30846	10.69154	10.00881	10.70034	30
31	30028	99117	30911	69089	00883	69972	29
32	30090	99114	30975	69025	00886	69910	28
33	30151	99112	31040	68960	00888	69849	27
34	30213	99109	31104	68896	00891	69787	26
35	30275	99106	31168	68831	00894	69725	25
36	30336	99104	31233	68767	00896	69664	24
37	30398	99101	31297	68703	00899	69602	23
38	30459	99099	31361	68639	00901	69541	22
39	30521	99096	31424	68575	00904	69479	21
40	9.30582	9.99093	9.31489	10.68511	10.00907	10.69418	20
41	30643	99091	31552	68448	00909	69357	19
42	30704	99088	31616	68384	00912	69296	18
43	30765	99086	31679	68320	00914	69235	17
44	30826	99083	31743	68257	00917	69174	16
45	30887	99080	31806	68194	00920	69113	15
46	30947	99078	31870	68130	00922	69053	14
47	31008	99075	31933	68067	00925	68992	13
48	31068	99072	31996	68004	00928	68931	12
49	31129	99070	32059	67941	00930	68871	11
50	9.31189	9.99067	9.32122	10.67878	10.00933	10.68811	10
51	31249	99064	32185	67815	00936	68750	9
52	31310	99062	32248	67752	00938	68690	8
53	31370	99059	32311	67689	00941	68630	7
54	31430	99056	32373	67627	00944	68570	6
55	31490	99054	32436	67564	00946	68510	5
56	31549	99051	32498	67502	00949	68451	4
57	31609	99048	32561	67439	00952	68391	3
58	31669	99046	32623	67377	00954	68331	2
59	31728	99043	32685	67315	00957	68272	1
60	31788	99040	32747	67253	00960	68212	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.53405	9.97299	9.56107	10.43893	10.02701	10.46595	60
1	53440	97294	56146	43854	02706	46560	59
2	53475	97289	56185	43815	02711	46525	58
3	53500	97285	56224	43776	02715	46491	57
4	53545	97280	56264	43736	02700	46456	56
5	53578	97275	56303	43697	02704	46422	55
6	53613	97271	56342	43658	02709	46383	54
7	53647	97266	56381	43619	02734	46353	53
8	53682	97262	56420	43580	02737	46318	52
9	53716	97257	56459	43541	02743	46284	51
10	9.53751	9.97252	9.56498	10.43502	10.02748	10.46249	50
11	53785	97248	56537	43463	02752	46215	49
12	53819	97243	56576	43424	02757	46181	48
13	53854	97238	56615	43385	02762	46146	47
14	53888	97234	56654	43346	02766	46112	46
15	53922	97229	56693	43307	02771	46078	45
16	53957	97224	56732	43268	02776	46043	44
17	53991	97220	56771	43229	02780	46009	43
18	54025	97215	56810	43190	02785	45975	42
19	54059	97210	56840	43151	02789	45941	41
20	9.54093	9.97206	9.56887	10.43113	10.02794	10.45909	40
21	54127	97201	56926	43074	02799	45873	39
22	54161	97196	56965	43035	02804	45839	38
23	54195	97192	57004	42996	02808	45805	37
24	54229	97187	57042	42958	02813	45771	36
25	54263	97182	57081	42919	02818	45737	35
26	54297	97178	57120	42880	02822	45703	34
27	54331	97173	57158	42842	02827	45669	33
28	54365	97168	57197	42803	02832	45635	32
29	54399	97163	57235	42765	02837	45601	31
30	9.54432	9.97149	9.57274	10.42726	10.02841	10.45567	30
31	54466	97154	57312	42688	02846	45534	29
32	54500	97149	57351	42649	02851	45500	28
33	54534	97145	57389	42611	02855	45466	27
34	54567	97140	57428	42572	02860	45433	26
35	54601	97135	57469	42534	02865	45399	25
36	54635	97130	57504	42496	02870	45365	24
37	54668	97126	57543	42457	02874	45332	23
38	54702	97121	57581	42419	02879	45298	22
39	54735	97110	57619	42381	02884	45265	21
40	9.54769	9.97116	9.57658	10.42342	10.02889	10.45231	20
41	54802	97106	57696	42304	02893	45198	19
42	54836	97102	57734	42266	02898	45164	18
43	54869	97097	57772	42228	02903	45131	17
44	54803	97092	57810	42190	02908	45097	16
45	54936	97087	57849	42151	02913	45064	15
46	54969	97083	57887	42113	02917	45031	14
47	55003	97078	57925	42075	02922	44997	13
48	55036	97073	57963	42037	02927	44964	12
49	55069	97068	58001	41998	02932	44931	11
50	9.55102	9.97063	9.58039	10.41961	10.02937	10.44898	10
51	55136	97059	58077	41923	02941	44864	9
52	55169	97054	58115	41885	02946	44831	8
53	55202	97049	58153	41847	02951	44790	7
54	55235	97044	58191	41809	02966	44765	6
55	55268	97039	58229	41771	02961	44732	5
56	55301	97034	58267	41733	02965	44699	4
57	55334	97030	58304	41696	02970	44666	3
58	55367	97025	58342	41658	02975	44633	2
59	55400	97020	58380	41620	02980	44600	1
60	55433	97015	58418	41582	02985	44567	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.55433	9.97015	9.58418	10.41582	10.02985	10.44567	60
1	55466	97010	58455	41545	02990	44534	59
2	55499	97005	58493	41507	02995	44501	58
3	55531	97001	58531	41469	02999	44468	57
4	55564	96996	58569	41431	03004	44436	56
5	55597	96991	58606	41394	03009	44403	55
6	55630	96986	58644	41356	03014	44370	54
7	55663	96981	58681	41319	03019	44337	53
8	55695	96976	58719	41231	03024	44305	52
9	55728	96971	58757	41243	03029	44272	51
10	9.55761	9.96966	9.58794	10.41206	10.03034	10.44239	50
11	55793	96962	58832	41168	03038	44207	49
12	55826	96957	58869	41131	03043	44104	48
13	55858	96952	58907	41093	03048	44142	47
14	55891	96947	58944	41056	03053	44109	46
15	55923	96942	58981	41019	03058	44077	45
16	55926	96937	59019	40981	03063	44044	44
17	55988	96932	59056	40944	03068	44012	43
18	56021	96927	59094	40906	03073	43979	42
19	56053	96922	59131	40869	03078	43947	41
20	9.56085	9.96917	9.59168	10.40832	10.03083	10.43914	40
21	56118	96912	59205	40795	03088	43882	39
22	56150	96907	59243	40757	03093	43850	38
23	56182	96903	59280	40720	03097	43818	37
24	56215	96898	59317	40683	03102	43785	36
25	56247	96893	59354	40646	03107	43753	35
26	56279	96888	59391	40609	03112	43721	34
27	56311	96883	59429	40571	03117	43689	33
28	56343	96878	59466	40534	03122	43657	32
29	56375	96873	59503	40497	03127	43625	31
30	9.56408	9.96868	9.59540	10.40460	10.03132	10.43592	30
31	56440	96863	59577	40423	03137	43560	29
32	56472	96858	59614	40386	03142	43528	28
33	56504	96853	59651	40349	03147	43496	27
34	56536	96848	59688	40312	03152	43464	26
35	56568	96843	59725	40275	03157	43432	25
36	56599	96838	59762	40238	03162	43400	24
37	56631	96833	59799	40201	03167	43369	23
38	56663	96828	59835	40165	03172	43337	22
39	56695	96823	59872	40128	03177	43305	21
40	9.56727	9.96818	9.59909	10.40091	10.03182	10.43273	20
41	56759	96813	59946	40054	03187	43241	19
42	56790	96808	59983	40017	03192	43210	18
43	56822	96803	60019	39981	03197	43178	17
44	56854	96798	60056	39944	03202	43146	16
45	56886	96793	60093	39907	03207	43114	15
46	56917	96788	60130	39870	03212	43083	14
47	56949	96783	60166	39834	03217	43051	13
48	56980	96778	60203	39797	03222	43020	12
49	57012	96772	60239	39760	03228	42988	11
50	9.57044	9.96767	9.60276	10.39724	10.03232	10.42956	10
51	57075	96762	60313	39687	03238	42925	9
52	57107	96757	60349	39651	03243	42893	8
53	57138	96752	60386	39614	03248	42862	7
54	57169	96747	60422	39578	03253	42830	6
55	57201	96742	60459	39541	03258	42790	5
56	57232	96737	60495	39505	03263	42768	4
57	57264	96732	60532	39468	03268	42736	3
58	57295	96727	60568	39432	03273	42705	2
59	57326	96722	60605	39395	03278	42674	1
60	57357	96717	60641	39359	03283	42642	0
	Co-sine.	Sine,	Co-tang	Tang.	Co-sec	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.38368	9.98690	9.39577	10.60323	10.01310	10.61632	60
1	38418	98687	39731	60269	01313	61582	59
2	38469	98684	39785	60215	01316	61531	58
3	38519	98681	39838	60162	01319	61481	57
4	38570	98678	39892	60108	01322	61430	56
5	38620	98675	39945	60054	01325	61380	55
6	38670	98671	39999	60001	01329	61330	54
7	38721	98668	40052	59948	01332	61280	53
8	38771	98665	40106	59894	01335	61229	52
9	38821	98662	40152	59841	01338	61179	51
10	9.38871	9.98659	9.40212	10.59788	10.01341	10.61129	50
11	38921	98655	40266	59734	01344	61079	49
12	38971	98652	40319	59681	01348	61029	48
13	39021	98649	40373	59628	01351	60979	47
14	39071	98646	40425	59575	01354	60929	46
15	39121	98643	40478	59522	01357	60879	45
16	39170	98640	40531	59469	01360	60830	44
17	39220	98636	40584	59416	01364	60780	43
18	39270	98633	40636	59363	01367	60730	42
19	39319	98630	40689	59311	01371	60681	41
20	9.39369	9.98627	9.40742	10.59258	10.01373	10.60631	40
21	39418	98623	40795	59205	01377	60582	39
22	39467	98620	40847	59153	01380	60533	38
23	39517	98617	40900	59100	01383	60483	37
24	39566	98614	40952	59048	01386	60434	36
25	39615	98610	41004	58995	01390	60385	35
26	39664	98607	41057	58943	01393	60336	34
27	39713	98602	41109	58891	01396	60287	33
28	39762	98601	41161	58839	01399	60238	32
29	39811	98597	41214	58786	01403	60189	31
30	9.39860	9.98594	9.41266	10.58734	10.01406	10.60140	30
31	39909	98590	41318	58682	01409	60091	29
32	39957	98588	41370	58630	01412	60042	28
33	40006	98584	41422	58578	01416	59994	27
34	40055	98581	41474	58526	01419	59945	26
35	40103	98578	41526	58474	01422	59896	25
36	40152	98574	41577	58422	01426	59848	24
37	40200	98571	41629	58371	01429	59800	23
38	40249	98568	41681	58319	01432	59751	22
39	40267	98565	41733	58267	01435	59703	21
40	9.40345	9.98561	9.41784	10.58216	10.01439	10.59654	20
41	40394	98558	41836	58164	01442	59606	19
42	40442	98555	41887	58113	01445	59558	18
43	40490	98551	41939	58061	01449	59510	17
44	40538	98548	41990	58010	01452	59462	16
45	40586	98545	42041	57958	01455	59414	15
46	40634	98541	42093	57907	01459	59366	14
47	40682	98538	42144	57856	01462	59318	13
48	40730	98535	42195	57805	01465	59270	12
49	40778	98531	42246	57754	01469	59222	11
50	9.40825	9.98528	9.42297	10.57703	10.01472	10.59175	10
51	40873	98525	42348	57652	01475	59127	9
52	40921	98521	42399	57601	01479	59079	8
53	40968	98518	42450	57550	01482	59032	7
54	41016	98515	42501	57499	01485	58984	6
55	41063	98511	42552	57448	01489	58937	5
56	41111	98508	42603	57397	01492	58889	4
57	41158	98504	42653	57347	01495	58842	3
58	41205	98501	42704	57296	01499	58795	2
59	41252	98498	42755	57245	01502	58748	1
60	41360	98494	42805	57195	01506	58700	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.41300	9.98494	9.42805	10.57195	10.01506	10.58700	60
1	41347	98495	42856	57144	01509	58655	59
2	41394	98488	42906	57094	01512	58606	58
3	41441	98484	42957	57043	01516	58559	57
4	41488	98481	43007	56993	01519	58512	56
5	41535	98477	43057	56943	01523	58465	55
6	41582	98474	43108	56892	01526	58418	54
7	41628	98471	43158	56842	01529	58372	53
8	41675	98467	43208	56792	01533	58325	52
9	41722	98464	43258	56742	01536	58278	51
10	9.41768	9.98460	9.43308	10.56692	10.01540	10.58232	50
11	41815	98457	43358	56642	01543	58185	49
12	41861	98453	43408	56592	01547	58138	48
13	41908	98450	43458	56542	01550	58092	47
14	41954	98447	43508	56492	01553	58046	46
15	42001	98443	43558	56442	01557	57999	45
16	42047	98440	43607	56393	01560	57933	44
17	42093	98436	43657	56343	01564	57907	43
18	42139	98433	43707	56293	01567	57860	42
19	42186	98429	43750	56244	01571	57814	41
20	9.42232	9.98426	9.43806	10.56194	10.01574	10.57768	40
21	42278	98422	43855	56145	01578	57722	39
22	42324	98419	43905	56095	01581	57676	38
23	42370	98415	43954	56046	01584	57630	37
24	42416	98412	44004	55996	01588	57584	36
25	42461	98409	44053	55947	01591	57538	35
26	42507	98405	44102	55898	01595	57493	34
27	42553	98402	44151	55848	01598	57447	33
28	42599	98398	44201	55799	01602	57401	32
29	42644	98395	44250	55750	01605	57356	31
30	9.42690	9.98391	9.44299	10.55701	10.01609	10.57310	30
31	42735	98388	44348	55652	01612	57265	29
32	42781	98384	44397	55603	01616	57219	28
33	42826	98381	44446	55554	01619	57174	27
34	42872	98377	44495	55505	01623	57128	26
35	42916	98373	44544	55456	01626	57083	25
36	42962	98370	44592	55408	01630	57038	24
37	43057	98366	44641	55359	01634	56993	23
38	43053	98363	44690	55310	01637	56947	22
39	43098	98359	44738	55262	01641	56902	21
40	9.43143	9.98356	9.44787	10.55213	10.01644	10.56857	20
41	43188	98352	44836	55164	01648	56812	19
42	43233	98349	44884	55116	01651	56767	18
43	43278	98345	44933	55067	01655	56722	17
44	43323	98342	44981	55019	01658	56677	16
45	43367	98337	45029	54971	01662	56632	15
46	43412	98334	45078	54522	01666	56588	14
47	43457	98331	45126	54874	01669	56543	13
48	43502	98327	45174	54826	01673	56498	12
49	43546	98324	45222	54778	01679	56454	11
50	9.43591	9.98320	9.45271	10.54729	10.01680	10.56409	10
51	43635	98317	45319	54681	01683	56365	9
52	43680	98313	45367	54633	01687	56320	8
53	43724	98309	45415	54585	01691	56276	7
54	43769	98306	45463	54537	01694	56231	6
55	43813	98302	45511	54489	01698	56187	5
56	43851	98299	45550	54441	01701	56143	4
57	43907	98295	45606	54394	01705	56099	3
58	43946	98291	45654	54346	01709	56054	2
59	43990	96288	45702	54298	01712	56010	1
60	44034	98284	45750	54250	01716	55966	0
	Co-sine.	Sine.	Co-tang	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.60931	9.96073	9.64858	10.35142	10.03927	10.39069	60
1	60960	96067	64892	35108	03933	39040	59
2	60988	96062	64926	35074	03938	39012	58
3	61016	96056	64960	35040	03944	38984	57
4	61045	96050	64994	35006	03950	38955	56
5	61073	96045	65028	34972	03955	38927	55
6	61101	96039	65062	34938	03961	38899	54
7	61129	96034	65096	34904	03966	38871	53
8	61158	96028	65130	34870	03972	38842	52
9	61186	96022	65164	34836	03978	38814	51
10	9.61214	9.96017	9.65197	10.34803	10.03983	10.38786	50
11	61242	96011	65231	34769	03989	38758	49
12	61270	96005	65265	34735	03995	38730	48
13	61298	95999	65299	34701	04000	38702	47
14	61326	95994	65333	34667	04006	38674	46
15	61354	95988	65366	34634	04012	38646	45
16	61382	95982	65400	34600	04018	38618	44
17	61411	95977	65434	34566	04023	38589	43
18	61438	95971	65467	34533	04029	38561	42
19	61466	95965	65501	34499	04035	38534	41
20	9.61494	9.95960	9.65535	10.34466	10.04040	10.38506	40
21	61522	95954	65568	34432	04046	38478	39
22	61550	95948	65602	34398	04052	38450	38
23	61578	95942	65636	34364	04058	38422	37
24	61606	95937	65669	34331	04063	38394	36
25	61634	95931	65702	34297	04069	38366	35
26	61662	95925	65736	34264	04075	38338	34
27	61689	95920	65770	34230	04080	38312	33
28	61717	95914	65803	34197	04086	38283	32
29	61745	95908	65837	34163	04092	38255	31
30	9.61773	9.95902	9.65870	10.34130	10.04098	10.38227	30
31	61800	95896	65904	34096	04103	38200	29
32	61828	95891	65937	34063	04109	38172	28
33	61856	95885	65971	34029	04115	38144	27
34	61883	95879	66004	33996	04121	38117	26
35	61911	95873	66038	33962	04127	38089	25
36	61949	95868	66071	33929	04132	38061	24
37	61966	95862	66104	33896	04138	38034	23
38	61994	95856	66138	33862	04144	38006	22
39	62021	95850	66171	33829	04150	38979	21
40	9.62049	9.95844	9.66204	10.33796	10.04156	10.37951	20
41	62076	95839	66238	33762	04161	37924	19
42	62108	95833	66271	33729	04167	37896	18
43	62131	95827	66304	33696	04173	37869	17
44	62159	95821	66333	33663	04179	37841	16
45	62186	95815	66371	33629	04185	37814	15
46	62214	95810	66404	33596	04190	37786	14
47	62241	95804	66437	33563	04196	37759	13
48	62268	95898	66470	33530	04202	37732	12
49	62296	95792	66503	33497	04208	37704	11
50	9.62323	9.95786	9.66537	10.33463	10.04214	10.37677	10
51	62350	95780	66570	33430	04220	37650	9
52	62377	95775	66603	33397	04225	37623	8
53	62405	95769	66636	33364	04231	37595	7
54	62432	95763	66669	33331	04237	37568	6
55	62459	95757	66701	33298	04243	37541	5
56	62486	95751	66735	33265	04249	37514	4
57	62513	95745	66768	33232	04255	37487	3
58	62541	95739	66801	33199	04261	37459	2
59	62568	95733	66834	33166	04267	37432	1
60	62595	95728	66867	33133	04272	37405	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.59188	9.96403	9.62785	10.37215	10.03597	10.40812	60
1	59217	96397	62820	37180	03603	40782	59
2	59247	96392	62855	37145	03608	40753	58
3	59277	96386	62890	37110	03613	40723	57
4	59307	96381	62926	37074	03619	40693	56
5	59336	96376	62961	37039	03624	40664	55
6	59366	96370	62996	37004	03630	40634	54
7	59396	96364	63031	36969	03635	40604	53
8	59425	96360	63066	36934	03640	40575	52
9	59455	96354	63101	36890	03646	40545	51
10	9.59484	9.96549	9.63135	10.36865	10.03651	10.40516	50
11	59514	96343	63170	36830	03657	40486	49
12	59543	96338	63205	36795	03662	40457	48
13	59573	96333	63240	36760	03667	40427	47
14	59602	96327	63275	36725	03673	40398	46
15	59632	96322	63310	36690	03678	40368	45
16	59661	96316	63345	36655	03684	40339	44
17	59690	96311	63379	36620	03689	40310	43
18	59720	96305	63414	36586	03695	40280	42
19	59749	96300	63449	36551	03700	40251	41
20	9.59778	9.96204	9.63484	10.36516	10.03706	10.40222	40
21	59808	96289	63519	36481	03711	40192	39
22	59837	96284	63553	36447	03716	40163	38
23	59896	96278	63588	36412	03722	40134	37
24	59895	96273	63623	36377	03727	40105	36
25	59924	96267	63657	36343	03733	40076	35
26	59954	96262	63692	36308	03738	40046	34
27	59983	96256	63726	36274	03744	40017	33
28	60012	96251	63761	36239	03749	39988	32
29	60041	96245	63796	36204	03755	39959	31
30	9.60070	9.96240	9.63830	10.36170	10.03760	10.39930	30
31	60099	96234	63865	36135	03766	39901	29
32	60128	96228	63899	36101	03771	39872	28
33	60156	96223	63934	36066	03777	39843	27
34	60186	96217	63968	36032	03783	39814	26
35	60215	96212	64003	35997	03788	39785	25
36	60244	96207	64037	35963	03794	39756	24
37	60273	96201	64072	35928	03798	39727	23
38	60302	96296	64106	35894	03804	39698	22
39	60331	96290	64140	35860	03810	39669	21
40	9.60359	9.96185	9.64175	10.35825	10.03815	10.39641	20
41	60388	96179	64209	35791	03821	39612	19
42	60417	96174	64243	35757	03826	39583	18
43	60446	96168	64278	35722	03832	39554	17
44	60474	96162	64312	35688	03838	39525	16
45	60503	96157	64346	35654	03843	39497	15
46	60532	96151	64381	35619	03849	39468	14
47	60561	96146	64415	35585	03855	39439	13
48	60589	96140	64449	35551	03860	39411	12
49	60618	96135	64483	35517	03866	39382	11
50	9.60646	9.96129	9.64517	10.35483	10.03871	10.39353	10
51	60675	96124	64552	35448	03877	39325	9
52	60704	96113	64586	35414	03882	39296	8
53	60732	96112	64620	35380	03888	39268	7
54	60761	96107	64654	35346	03893	39239	6
55	60789	96101	64688	35312	03999	39211	5
56	60818	96095	64722	35278	03905	39182	4
57	60846	96090	64756	35244	03910	39154	3
58	60874	96084	64790	35210	03915	39125	2
59	60903	96079	64824	35176	03921	39097	1
60	60931	96073	64858	35147	03927	39069	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.64184	9.95366	9.68818	10.31182	10.04634	10.35816	60
1	64210	95360	68850	31150	04640	35790	59
2	64236	95354	68882	31118	04646	35764	58
3	64262	95348	68914	31086	04652	35738	57
4	64288	95341	68946	31054	04659	35712	56
5	64313	95335	68978	31022	04665	35687	55
6	64339	95329	69010	30990	04671	35661	54
7	64365	95323	69042	30958	04677	35635	53
8	64391	95317	69074	30926	04683	35609	52
9	64417	95310	69106	30894	04690	35583	51
10	9.64442	9.95304	9.69138	10.30862	10.04696	10.35558	50
11	64468	95298	69170	30830	04702	35532	49
12	64494	95292	69202	30798	04708	35506	48
13	64519	95286	69234	30766	04714	35481	47
14	64545	95279	69266	30734	04721	35455	46
15	64571	95273	69298	30702	04727	35429	45
16	64596	95267	69329	30671	04733	35404	44
17	64622	95261	69361	30639	04739	35378	43
18	64647	95254	69393	30607	04746	35353	42
19	64673	95248	69425	30575	04752	35327	41
20	9.64698	9.95242	9.69457	10.30543	10.04758	10.35302	40
21	64724	95236	69488	30512	04764	35276	39
22	64749	95229	69520	30480	04771	35251	38
23	64775	95223	69552	30448	04777	35225	37
24	64800	95217	69584	30416	04783	35200	36
25	64826	95211	69615	30385	04789	35174	35
26	64851	95204	69847	30353	04796	35149	34
27	64877	95198	69679	30321	04802	35123	33
28	64902	95192	69710	30290	04808	35098	32
29	64927	95185	69742	30258	04815	35073	31
30	9.64953	9.95179	9.69774	10.30226	10.04821	10.35047	30
31	64978	95173	69805	30195	04827	35022	29
32	65003	95167	69837	30163	04833	34997	28
33	65029	95160	69868	30132	04840	34971	27
34	65054	95154	69900	30100	04846	34946	26
35	65079	95148	69932	30068	04852	34821	25
36	65104	95141	69963	30037	04859	34896	24
37	65130	95135	69995	30005	04865	34870	23
38	65155	95129	70026	29974	04871	34845	22
39	65180	95122	70058	29942	04878	34820	21
40	9.65205	9.95116	9.70089	10.29911	10.04884	10.34795	20
41	65230	95110	70121	29879	04890	34770	19
42	65255	95103	70152	29848	04897	34745	18
43	65281	95097	70184	29816	04903	34719	17
44	65306	95090	70215	29785	04910	34694	16
45	65331	95084	70247	29753	04916	34669	15
46	65356	95078	70278	29722	04922	34644	14
47	65381	95071	70309	29691	04929	34619	13
48	65406	95065	70341	29659	04935	34594	12
49	65431	95059	70372	29628	04941	34569	11
50	9.65456	9.95052	9.70404	10.29596	10.04948	10.34544	10
51	65481	95046	70435	29565	04954	34519	9
52	65506	95039	70466	29534	04961	34494	8
53	65531	95033	70498	29502	04967	34469	7
54	65556	95027	70529	29471	04973	34444	6
55	65580	95020	70560	29440	04980	34420	5
56	65605	95014	70592	29408	04986	34395	4
57	65630	95007	70623	29377	04993	34370	3
58	65655	95001	70654	29346	04999	34345	2
59	65680	94994	70685	29315	05005	34320	1
60	65705	94988	70717	29283	05012	34295	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.65705	9.94988	9.70717	10.29283	10.05022	10.34295	60
1	65729	94982	70748	29252	05018	34271	59
2	65754	94975	70779	29221	05025	34246	58
3	65779	94969	70810	29190	05031	34221	57
4	65804	94962	70841	29159	05038	34196	56
5	65828	94956	70873	29127	05044	34172	55
6	65853	94949	70904	29096	05051	34147	54
7	65878	94943	70935	29065	05057	34122	53
8	65902	94936	70966	29034	05064	34098	52
9	65927	94930	70997	29003	05070	34073	51
10	9.65952	9.94923	9.71028	10.28972	10.05077	10.34048	50
11	65976	94917	71059	28941	05083	34024	49
12	66001	94910	71090	28910	05089	33999	48
13	66025	94904	71121	28879	05096	33975	47
14	66050	94898	71153	28847	05102	33950	46
15	66075	94891	71184	28816	05109	33925	45
16	66099	94884	71215	28785	05115	33901	44
17	66124	94878	71246	28754	05122	33876	43
18	66148	94871	71277	28723	05129	33852	42
19	66173	94865	71308	28692	05125	33827	41
20	9.66197	9.94858	9.71339	10.28661	10.05142	10.33803	40
21	66221	94852	71370	28630	05148	33779	39
22	66246	94845	71401	28599	05155	33754	38
23	66270	94839	71431	28568	05161	33730	37
24	66295	94832	71462	28538	05168	33705	36
25	66319	94826	71493	28507	05174	33684	35
26	66343	94819	71524	28476	05181	33657	34
27	66368	94813	71555	28445	05187	33632	33
28	66392	94806	71586	28414	05194	33608	32
29	66416	94799	71617	28383	05201	33584	31
30	9.66441	9.94793	9.71648	10.28352	10.05207	10.33559	30
31	66465	94786	71679	28321	05214	33535	29
32	66489	94780	71709	28291	05220	33511	28
33	66513	94773	71740	28260	05227	33487	27
34	66537	94767	71771	28229	05233	33463	26
35	66562	94760	71802	28198	05240	33438	25
36	66586	94753	71833	28167	05247	33414	24
37	66610	94747	71863	28137	05253	33390	23
38	66634	94740	71894	28106	05260	33366	22
39	66658	94734	71925	28075	05266	33342	21
40	9.66682	9.94727	9.71955	10.28045	10.05273	10.33318	20
41	66706	94720	71986	28014	05280	33293	19
42	66731	94714	72017	27983	05286	33269	18
43	66755	94707	72048	27952	05293	33245	17
44	66779	94700	72078	27922	05300	33221	16
45	66803	94694	72109	27891	05306	33197	15
46	66827	94687	72140	27860	05313	33173	14
47	66851	94680	72170	27830	05320	33149	13
48	66875	94674	72201	27799	05336	33125	12
49	66899	94667	72231	27769	05333	33101	11
50	9.66922	9.94660	9.72262	10.27738	10.05340	10.33078	10
51	66946	94654	72293	27707	05346	33054	9
52	66970	94647	72329	27678	05353	35030	8
53	66994	94640	72354	27646	05360	33006	7
54	67018	94634	72384	27616	05366	32982	6
55	67042	94627	72415	27585	05373	32958	5
56	67066	94620	72445	27555	05380	32934	4
57	67090	94614	72476	27524	05386	32910	3
58	67113	94607	72506	27493	05393	32887	2
59	67137	94600	72537	27463	05400	32863	1
60	67161	94593	72567	27433	05407	32830	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.67161	9.94593	9.72567	10.27433	10.05407	10.32839	60
1	67185	94587	72598	27402	05413	32815	59
2	67208	94580	72628	27372	05420	32792	58
3	67232	94573	72659	27341	05427	32768	57
4	67256	94567	72689	27311	05432	32744	56
5	67280	94560	72720	27280	05440	32720	55
6	67303	94553	72750	27250	05447	32697	54
7	67327	94546	72780	27220	05454	32673	53
8	67350	94540	72811	27189	05460	32650	52
9	67374	94533	72841	27159	05467	32625	51
10	9.67398	9.94526	9.72872	10.27128	10.05474	10.32602	50
11	67421	94519	72902	27098	05481	32579	49
12	67445	94513	72932	27068	05487	32555	48
13	67468	94506	72963	27037	05494	32532	47
14	67492	94499	72993	27007	05501	32508	46
15	67515	94492	73023	26977	05508	32485	45
16	67539	94485	73054	26946	05515	32461	44
17	67562	94479	73084	26916	05521	32438	43
18	67586	94472	73114	26886	05528	32414	42
19	67609	94465	73144	26856	05535	32391	41
20	9.67633	9.94458	9.73275	10.26825	10.05542	10.32367	40
21	67656	94451	73205	26795	05549	32344	39
22	67680	94445	73235	26765	05555	32320	38
23	67703	94438	73265	26735	05562	32297	37
24	67726	94431	73295	26705	05569	32274	36
25	67750	94424	73226	26674	05576	32250	35
26	67773	94417	73356	26644	05583	32227	34
27	67796	94410	73386	26614	05590	32204	33
28	67820	94404	73416	26584	05596	32180	32
29	67843	94397	73446	26554	05603	32157	31
30	9.67866	9.94388	9.73476	10.26524	10.05610	10.32134	30
31	67890	94383	73507	26493	05617	32110	29
32	67913	94376	73537	26463	05624	32087	28
33	67936	94369	73567	26433	05631	32064	27
34	67959	94362	73597	26403	05638	32041	26
35	67982	94355	73627	26373	05645	32018	25
36	68006	94349	73657	26343	05651	31994	24
37	68029	94342	73687	26313	05658	31971	23
38	68052	94335	73717	26283	05665	31948	22
39	68075	94329	73747	26253	05672	31925	21
40	9.68068	9.94321	9.73777	10.26223	10.05679	10.31902	20
41	68121	94314	73807	26193	05686	31879	19
42	68144	94307	73837	26163	05693	31856	18
43	68167	94300	73867	26133	05700	31833	17
44	68190	94293	73897	26103	05707	31810	16
45	68213	94286	73927	26073	05714	31787	15
46	68237	94279	73957	26043	05721	31763	14
47	68260	94273	73987	26013	05727	31740	13
48	68282	94266	74017	25983	05734	31718	12
49	68305	94259	74047	25953	05741	31695	11
50	9.68328	9.94252	9.74077	10.25923	10.05748	10.31672	10
51	68351	94245	74107	25893	05755	31649	9
52	68374	94238	74137	25863	05762	31626	8
53	68397	94231	74166	25833	05769	31603	7
54	68420	94224	74196	25803	05776	31580	6
55	68443	94217	74226	25774	05783	31557	5
56	68466	94210	74256	25744	05790	31534	4
57	68489	94203	74286	25714	05797	31511	3
58	68511	94196	74316	25684	05804	31488	2
59	68534	94189	74345	25655	05811	31466	1
60	68557	94182	74375	25925	05818	31443	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang	Secant.	Co-sec.	
0	9.68557	9.94182	9.74375	10.25625	10.05818	10.31443	60
1	68580	94175	74405	25595	05825	31420	59
2	68603	94168	74435	25565	05832	31397	58
3	68625	94161	74465	25535	05839	31375	57
4	68648	94154	74495	25506	05846	31352	56
5	68671	94147	74524	25476	05853	31329	55
6	68694	94140	74554	25446	05860	31306	54
7	68716	94133	74585	25417	05867	31384	53
8	68739	94126	74613	25387	05874	31261	52
9	68762	94110	74633	25357	05881	31238	51
10	9.68784	9.94112	9.74673	10.25327	10.05888	10.31216	50
11	68807	94105	74702	25298	05895	31193	49
12	68829	94098	74732	25268	05902	31170	48
13	68852	94090	74762	25238	05910	31148	47
14	68875	94083	74791	25209	05917	31125	46
15	68894	94076	74821	25179	05924	31103	45
16	68920	94069	74851	25149	05931	31080	44
17	68942	94062	74880	25120	05938	31058	43
18	68965	94055	74910	25090	05945	31035	42
19	68987	94048	74936	25061	05952	31013	41
20	9.69010	9.94041	9.74969	10.25031	10.05959	10.30990	40
21	69032	94034	74998	25002	05966	30968	39
22	69055	94027	75028	24972	05973	30945	38
23	69077	94020	75058	24942	05980	30923	37
24	69100	94012	75087	24913	05988	30900	36
25	69122	94005	75117	24883	05995	30878	35
26	69144	93998	75146	24854	06002	30856	34
27	69167	93991	75176	24824	06009	30833	33
28	69189	93984	75205	24795	06016	30811	32
29	69212	93977	75235	24765	06013	30788	31
30	9.69234	9.93970	9.75264	10.24736	10.06030	10.30766	30
31	69256	93963	75294	24706	06037	30744	29
32	69279	93955	75323	24677	06045	30721	28
33	69301	93948	75353	24647	06052	30699	27
34	69323	93941	75382	24618	06059	30677	26
35	69345	93934	75411	24588	06066	30655	25
36	69368	93927	75441	24559	06073	30632	24
37	69390	93919	75470	24530	06080	30610	23
38	69412	93912	75500	24500	06088	30588	22
39	69434	93905	75529	24471	06095	30566	21
40	9.69456	9.93898	9.75558	10.24441	10.06102	10.30544	20
41	69479	93891	75588	24412	06109	30521	19
42	69501	93884	75617	24383	06116	30499	18
43	69523	93876	75647	24353	06124	30477	17
44	69545	93869	75676	24324	06131	30455	16
45	69567	93862	75705	24295	06138	30433	15
46	69589	93855	75735	24265	06145	30411	14
47	69611	93847	75764	24236	06153	30389	13
48	69633	93840	75793	24207	06160	30367	12
49	69655	93833	75822	24178	06167	30345	11
50	9.69677	9.93826	9.75852	10.24148	10.06174	10.30323	10
51	69699	93819	75881	24119	06181	30301	9
52	69721	93811	75910	24090	06189	30279	8
53	69743	93804	75939	24060	06196	30256	7
54	69765	93717	75969	24031	06203	30255	6
55	69787	93789	75998	24002	06210	30213	5
56	69809	93782	76027	23973	06218	30191	4
57	69831	93775	76056	23944	06225	30169	3
58	69853	93768	76086	23914	06232	30147	2
59	69874	93760	76115	23885	06240	30125	1
60	69897	93753	76144	23856	06247	30103	0
	Co-sine.	Sine.	Co-tang	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.69897	9.93752	9.76144	10.23856	10.06247	10.30003	60
1	69919	93746	76173	23827	06254	30081	59
2	69941	93738	76202	23798	06261	30059	58
3	69963	93731	76231	23769	06269	30037	57
4	69984	93724	76261	23739	06276	30016	56
5	70006	93717	76290	23710	06283	29994	55
6	70028	93709	76319	23681	06291	29972	54
7	70050	93702	76348	23652	06298	29950	53
8	70072	93695	76377	23623	06305	29928	52
9	70093	93687	76406	23594	06313	29907	51
10	9.70115	9.93680	9.76435	10.23565	10.06320	10.29885	50
11	70137	93673	76464	23536	06327	29864	49
12	70159	93665	76493	23507	06335	29841	48
13	70180	93658	76522	23478	06342	29820	47
14	70202	93650	76551	23449	06350	29798	46
15	70224	93643	76580	23420	06357	29776	45
16	70245	93636	76609	23391	06364	29755	44
17	70267	93628	76639	23361	06372	29733	43
18	70288	93621	76668	23332	06379	29712	42
19	70310	93614	76697	23303	06386	29690	41
20	9.70332	9.93606	9.76725	10.23274	10.06394	10.29668	40
21	70353	93599	76754	23246	06401	29647	39
22	70375	93591	76783	23217	06409	29625	38
23	70396	93584	76812	23188	06416	29604	37
24	70418	93577	76841	23159	06423	29582	36
25	70439	93569	76870	23130	06431	29561	35
26	70461	93562	76899	23101	06438	29539	34
27	70482	93554	76928	23073	06446	29518	33
28	70504	93547	76957	23043	06453	29496	32
29	70525	93539	76986	23014	06461	29475	31
30	9.70547	9.93532	9.77015	10.22925	10.06468	10.29453	30
31	70568	93525	77044	22956	06475	29432	29
32	70590	93517	77073	22927	06483	29410	28
33	70611	93510	77101	22899	06490	29389	27
34	70633	93502	77130	22870	06498	29367	26
35	70654	93495	77159	22841	06505	29346	25
36	70675	93487	77188	22812	06513	29325	24
37	70697	93480	77217	22783	06520	29303	23
38	70718	93472	77246	22754	06528	29282	22
39	70739	93465	77274	22726	06535	29261	21
40	9.70761	9.93457	9.77303	10.23697	10.06543	10.29239	20
41	70782	93450	77332	22668	06550	29218	19
42	70803	93442	77361	22639	06558	29197	18
43	70824	93435	77390	22610	06565	29175	17
44	70846	93427	77418	22582	06573	29154	16
45	70867	93420	77447	22553	06580	29133	15
46	70888	93412	77476	22524	06588	29112	14
47	70909	93405	77505	22495	06595	29091	13
48	70931	93397	77533	22467	06603	29069	12
49	70952	93390	77562	22438	06610	29048	11
50	9.70973	9.93382	9.77591	10.22409	10.06618	10.29027	10
51	70994	93375	77619	22381	06625	29006	9
52	71015	93367	77648	22352	06633	28985	8
53	71036	93360	77677	22323	06640	28964	7
54	71058	93352	77705	22294	06648	28942	6
55	71079	93344	77734	22266	06656	28921	5
56	71100	93337	77763	22237	06663	28900	4
57	71121	93329	77791	22208	06671	28879	3
58	71142	93322	77820	22180	06678	28858	2
59	71163	93314	77849	22151	06686	28837	1
60	71184	93307	77877	22123	06693	28816	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.71184	9.93307	9.79877	10.22123	10.06693	10.28816	60
1	71205	93299	79906	22094	06701	28795	59
2	71226	93291	79935	22065	06709	28774	58
3	71247	93284	79963	22037	06716	28753	57
4	71268	93276	79992	22008	06724	28732	56
5	71289	93269	78021	21980	06731	28711	55
6	71310	93261	78049	21951	06739	28690	54
7	71331	93253	78077	21923	06747	28669	53
8	71352	93246	78106	21894	06754	28648	52
9	71373	93238	78135	21865	06762	28627	51
10	9.71393	9.93230	9.78163	10.21837	10.06770	10.28607	50
11	71414	93223	78192	21808	06777	28586	49
12	71435	93215	78220	21780	06785	28565	48
13	71456	93207	78249	21751	06792	28544	47
14	71477	93200	78277	21723	06800	28523	46
15	71498	93192	78306	21694	06808	28502	45
16	71519	93184	78334	21666	06816	28481	44
17	71539	93177	78363	21637	06823	28461	43
18	71560	93169	78391	21609	06831	28440	42
19	71581	93161	78419	21580	06839	28419	41
20	9.71602	9.93154	9.78448	10.21552	10.06846	10.28398	40
21	71622	93146	78476	21524	06854	28378	39
22	71643	93138	78505	21495	06862	28357	38
23	71664	93131	78533	21467	06869	28336	37
24	71685	93123	78562	21438	06877	28315	36
25	71705	93115	78590	21419	06885	28295	35
26	71726	93107	78618	21382	06893	28274	34
27	71747	93100	78647	21353	06900	28253	33
28	71767	93092	78675	21325	06908	28233	32
29	71788	93084	78704	21296	06916	28212	31
30	9.71809	9.93077	9.78732	10.21268	10.06923	10.28191	30
31	71829	93069	78760	21240	06931	28171	29
32	71850	93061	78789	21211	06939	28150	28
33	71870	93053	78817	21183	06947	28130	27
34	71891	93046	78845	21155	06954	28119	26
35	71911	93038	78874	21126	06962	28089	25
36	71932	93030	78902	21098	06970	28068	24
37	71952	93022	78930	21070	06978	28048	23
38	71973	93014	78959	21041	06985	28027	22
39	71993	93007	78987	21013	06993	28007	21
40	9.72014	9.92999	9.79015	10.20985	10.07001	10.27986	20
41	72034	92991	79043	20957	07009	27965	19
42	72055	92983	79072	20928	07017	27945	18
43	72075	92975	79100	20900	07024	27925	17
44	72096	92968	79128	20872	07032	27904	16
45	72116	92960	79156	20844	07040	27884	15
46	72137	92952	79185	20815	07048	27863	14
47	72157	92944	79213	20787	07056	27843	13
48	72177	92936	79241	20759	07064	27823	12
49	72198	92929	79269	20731	07071	27802	11
50	9.72218	9.92921	9.79297	10.20703	10.07079	10.27782	10
51	72238	92913	79326	20674	07087	27761	9
52	72259	92905	79354	20646	07095	27741	8
53	72279	92897	79382	20618	07103	27721	7
54	72299	92889	79410	20590	07111	27701	6
55	72320	92881	79438	20562	07119	27680	5
56	72340	92874	79466	20534	07126	27660	4
57	72360	92866	79495	20505	07134	27640	3
58	72381	92858	79523	20477	07142	27619	2
59	72401	92850	79551	20449	07150	27599	1
60	72421	92842	79579	20421	07158	27579	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.72421	9.92842	9.79579	10.20421	10.07158	10.27579	60
1	72441	92834	79607	20393	07166	27559	59
2	72461	92826	79635	20365	07174	27539	58
3	72482	92818	79663	20337	07182	27518	57
4	72502	92810	79691	20309	07190	27498	56
5	72522	92803	79719	20281	07197	27478	55
6	72542	92795	79747	20253	07205	27458	54
7	72562	92787	79776	20224	07213	27438	53
8	72582	92779	79804	20196	07221	27418	52
9	72602	92771	79832	20168	07229	27398	51
10	9.72622	9.92763	9.79860	10.20140	10.07237	10.27378	50
11	72643	92755	79888	20112	07243	27357	49
12	72663	92747	79916	20084	07253	27337	48
13	72683	92739	79944	20056	07261	27317	47
14	72703	92731	79972	20028	07269	27297	46
15	72723	92723	80000	20000	07277	27277	45
16	72743	92715	80028	19972	07285	27257	44
17	72763	92707	80056	19944	07293	27237	43
18	72783	92699	80084	19916	07301	27217	42
19	72803	92691	80112	19888	07309	27197	41
20	9.72823	9.92683	9.80140	10.19860	10.07317	10.27177	40
21	72843	92675	80168	19832	07325	27157	39
22	72863	92667	80195	19805	07333	27137	38
23	72883	92659	80223	19778	07341	27117	37
24	72902	92651	80251	19749	07349	27098	36
25	72922	92643	80279	19721	07357	27078	35
26	72942	92635	80307	19693	07365	27058	34
27	72962	92627	80335	19665	07373	27038	33
28	72982	92619	80363	19637	07381	27018	32
29	73002	92611	80391	19609	07389	26998	31
30	9.73022	9.92603	9.80419	10.19581	10.07397	10.26978	30
31	73041	92595	80447	19553	07405	26959	29
32	73061	92587	80474	19526	07413	26939	28
33	73081	92579	80502	19498	07421	26919	27
34	73101	92571	80530	19470	07429	26899	26
35	73121	92563	80558	19442	07437	26879	25
36	73140	92556	80585	19414	07445	26860	24
37	73160	92546	80614	19386	07454	26840	23
38	73180	92538	80642	19358	07462	26820	22
39	73200	92530	80669	19331	07470	26800	21
40	9.73219	9.92522	9.80697	10.19303	10.07478	10.26781	20
41	73239	92514	80725	19275	07486	26761	19
42	73259	92506	80753	19247	07494	26741	18
43	73278	92498	80781	19219	07502	26722	17
44	73298	92490	80808	19192	07510	26702	16
45	73318	92482	80836	19164	07518	26682	15
46	73337	92473	80864	19136	07527	26663	14
47	73357	92465	80892	19108	07535	26643	13
48	73377	92457	80919	19081	07543	26623	12
49	73396	92449	80947	19053	07551	26604	11
50	9.73416	9.92441	9.80975	10.19025	10.07559	10.26584	10
51	73435	92433	81003	18997	07567	26565	9
52	73455	92425	81030	18970	07575	26545	8
53	73474	92416	81058	18942	07584	26526	7
54	73494	92408	81086	18914	07592	26506	6
55	73513	92400	81113	18887	07600	26487	5
56	73533	92392	81141	18859	07608	26467	4
57	73552	92384	81169	18831	07616	26448	3
58	73572	92376	81196	18804	07624	26428	2
59	73591	92367	81224	18776	.07633	26409	1
60	73611	92359	81252	18748	07641	26389	0
	Co-sine.	Sine.	Co-tang	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.73611	9.92359	9.81252	10.18748	10.07641	10.26389	60
1	73630	92351	81279	18721	07649	26370	59
2	73650	92343	81307	18693	07657	26350	58
3	73669	92334	81335	18665	07666	26331	57
4	73689	92326	81362	18638	07674	26311	56
5	73708	92318	81390	18610	07682	26292	55
6	73727	92310	81417	18582	07690	26273	54
7	73747	92302	81445	18555	07698	26253	53
8	73766	92293	81473	18527	07707	26234	52
9	73785	92285	81500	18500	07715	26215	51
10	9.73805	9.92277	9.81528	10.18472	10.07723	10.26195	50
11	73824	92269	81556	18444	07731	26176	49
12	73843	92260	81583	18417	07740	26157	48
13	73863	92252	81611	18389	07748	26137	47
14	73882	92244	81638	18362	07756	26118	46
15	73901	92235	81666	18334	07765	26099	45
16	73921	92227	81693	18307	07773	26079	44
17	73940	92219	81721	18279	07781	26060	43
18	73959	92211	81748	18252	07789	26041	42
19	73978	92202	81776	18224	07798	26022	41
20	9.73997	9.92194	9.81803	10.18197	10.07806	10.26002	40
21	74017	92186	81831	18169	07814	25983	39
22	74036	92177	81858	18142	07823	25964	38
23	64055	92169	81886	18114	07831	25945	37
24	74074	92161	81913	18087	07839	25926	36
25	74093	92152	81941	18059	07848	25907	35
26	74112	92144	81968	18032	07856	25887	34
27	74132	92136	81996	18004	07864	25868	33
28	74151	92127	82023	17977	07873	25849	32
29	74170	92119	82051	17949	07881	25830	31
30	9.74189	9.92111	9.82078	10.17922	10.07889	10.25811	30
31	74208	92102	82106	17894	07898	25792	29
32	74227	92094	82133	17867	07906	25773	28
33	74246	92086	82161	17839	07914	25754	27
34	74265	92077	83188	17812	07923	25735	26
35	74284	92069	82215	17784	07931	25716	25
36	74303	92060	82243	17757	07940	25697	24
37	74322	92052	82270	17730	07948	25678	23
38	74341	92044	82298	17702	07956	25659	22
39	74360	92035	82325	17675	07965	25640	21
40	9.74379	9.92027	9.82352	10.17648	10.07973	10.25621	20
41	74398	92018	82380	17620	07982	25602	19
42	74417	92010	82407	17593	07990	25583	18
43	74436	92002	82434	17565	07998	25564	17
44	74455	91993	82462	17538	08007	25545	16
45	74474	91985	82489	17511	08015	25526	15
46	74593	91976	82517	17483	08024	25507	14
47	74512	91968	82544	17456	08032	25488	13
48	74531	91959	82571	17429	08041	25469	12
49	74549	91951	82599	17401	08049	25451	11
50	9.74568	9.91942	9.82626	10.17374	10.08058	10.25432	10
51	74587	91934	82653	17347	08066	25413	9
52	74606	91925	82681	17319	08075	25394	8
53	74625	91917	82708	17292	08083	25375	7
54	74644	91908	82735	17265	08092	25356	6
55	74662	91890	82762	17238	08100	25338	5
56	74681	91881	82790	17210	08109	25319	4
57	74700	91883	82817	17183	08117	25300	3
58	74719	91874	82844	17156	08126	25281	2
59	74737	91866	82871	17129	08134	25263	1
60	74756	91857	82899	17101	08143	25244	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.76922	9.90796	9.86126	10.13874	10.09204	10.23078	60
1	76939	90787	86153	13847	09213	23061	59
2	76957	90777	86179	13821	09223	23043	58
3	76974	90768	86206	13794	09232	23026	57
4	76991	90759	86232	13768	09241	23009	56
5	77009	90750	86259	13741	09250	22991	55
6	77026	90741	86285	13715	09259	22974	54
7	77043	90731	86312	13688	09268	22957	53
8	77061	90722	86338	13662	09278	22939	52
9	77078	90713	86365	13635	09287	22922	51
10	9.77095	9.90704	9.86392	10.13608	10.09296	10.22905	50
11	77112	90694	86418	13582	09306	22888	49
12	77130	90685	86445	13555	09315	22870	48
13	77147	90676	86471	13529	09324	22853	47
14	77164	90667	86496	13502	09333	22836	46
15	77181	90657	86524	13476	09343	22819	45
16	77199	90648	86551	13449	09352	22801	44
17	77216	90639	86577	13423	09361	22784	43
18	77233	90630	86603	13397	09370	22767	42
19	77250	90620	86630	13370	09380	22750	41
20	9.77268	9.90611	9.86655	10.13344	10.09389	10.22732	40
21	77285	90602	86683	13317	09398	22715	39
22	77302	90592	86709	13291	09408	22698	38
23	77319	90583	86736	13264	09417	22681	37
24	77336	90574	86762	13238	09426	22664	36
25	77353	90565	86789	13211	09435	22647	35
26	77370	90555	86815	13185	09445	22630	34
27	77387	90546	86842	13158	09454	22613	33
28	77405	90537	86868	13132	09463	22595	32
29	77422	90527	86894	13106	09473	22578	31
30	9.77439	9.90518	9.86921	10.13079	10.09482	10.22561	30
31	77456	90509	86947	13053	09491	22544	29
32	77473	90499	86974	13026	09501	22527	28
33	77490	90490	87000	13000	09510	22510	27
34	77507	90480	87027	12973	09520	22493	26
35	77524	90471	87052	12947	09529	22476	25
36	77541	90462	87079	12921	09538	22459	24
37	77558	90453	87106	12894	09548	22442	23
38	77575	90443	87132	12868	09557	22425	22
39	77592	90434	87158	12842	09566	22408	21
40	9.77609	9.90424	9.87185	10.12815	10.09576	10.22391	20
41	77626	90415	87211	12789	09585	22374	19
42	77643	90405	87238	12762	09595	22357	18
43	77660	90396	87264	12736	09604	22340	17
44	77677	90386	87290	12710	09613	22324	16
45	77694	90377	87317	12683	09623	22306	15
46	77711	90368	87343	12657	09632	22289	14
47	77727	90358	87369	12631	09642	22272	13
48	77744	90349	87396	12604	09651	22256	12
49	77761	90339	87422	12578	09661	22239	11
50	9.77778	9.90330	9.87448	10.12552	10.09670	10.22222	10
51	77795	90320	87475	12525	09680	22205	9
52	77812	90311	87501	12499	09689	22188	8
53	77829	90301	87527	12473	09699	22171	7
54	77846	90292	87554	12446	09708	22154	6
55	77862	90282	87580	12420	09718	22138	5
56	77879	90273	87606	12394	09727	22121	4
57	77896	90263	87633	12367	09737	22104	3
58	77913	90254	87659	12341	09746	22087	2
59	77930	90244	87685	12315	09756	22076	1
60	77946	90235	87711	12289	09765	22054	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.77946	9.90235	9.87711	10.12289	10.09765	10.22054	60
1	77963	90225	87738	12262	09775	22037	59
2	77980	90216	87764	12236	09784	22020	58
3	77997	90206	87790	12210	09794	22003	57
4	78013	90197	87817	12183	09803	21987	56
5	78030	90187	87843	12157	09813	21970	55
6	78047	90178	87869	12131	09822	21953	54
7	78063	90168	87895	12105	09832	21937	53
8	78080	90159	87922	12078	09841	21920	52
9	78097	90149	87948	12052	09851	21903	51
10	9.78113	9.90139	9.87974	10.12026	10.09861	10.21887	50
11	78130	90130	88000	12000	09870	21870	49
12	78147	90120	88027	11973	09880	21853	48
13	78163	90111	88053	11947	09889	21837	47
14	78180	90101	88079	11921	09899	21820	46
15	78197	90091	88105	11895	09909	21803	45
16	78213	90082	88131	11869	09918	21787	44
17	78230	90072	88158	11842	09928	21770	43
18	78246	90063	88184	11816	09937	21754	42
19	78263	90053	88210	11790	09947	21737	41
20	9.78280	9.90043	9.88236	10.11764	10.09957	10.21720	40
21	78296	90034	88262	11738	09966	21704	39
22	78313	90024	88289	11711	09976	21687	38
23	78329	90014	88315	11685	09986	21671	37
24	78346	90005	88341	11659	09995	21654	36
25	78362	89995	88367	11633	10005	21638	35
26	78379	89985	88393	11607	10015	21621	34
27	78395	89976	88420	11580	10024	21605	33
28	78412	89966	88446	11554	10034	21588	32
29	78428	89956	88472	11528	10044	21572	31
30	9.78445	9.89947	9.88498	10.11502	10.10053	10.21555	30
31	78461	89937	88524	11476	10063	21539	29
32	78478	89927	88550	11450	10073	21522	28
33	78494	89917	88576	11424	10082	21506	27
34	78510	89908	88603	11397	10092	21490	26
35	78527	89898	88629	11371	10102	21473	25
36	78543	89888	88655	11345	10112	21457	24
37	78560	89879	88681	11319	10121	21440	23
38	78576	89869	88707	11293	10131	21424	22
39	78592	89859	88733	11267	10141	21408	21
40	9.78609	9.89849	9.88759	10.11241	10.10151	10.21391	20
41	78625	89840	88786	11214	10160	21375	19
42	78642	89830	88812	11188	10170	21358	18
43	78658	89820	88838	11162	10180	21342	17
44	78674	89810	88864	11136	10190	21326	16
45	78691	89801	88890	11110	10199	21309	15
46	78707	89791	88916	11084	10209	21293	14
47	78723	89781	88942	11058	10219	21277	13
48	78739	89771	88968	11032	10229	21261	12
49	78756	89761	88994	11006	10239	21244	11
50	9.78772	9.89752	9.89020	10.10980	10.10248	10.21228	10
51	78788	89742	89046	10954	10258	21212	9
52	78805	89732	89073	10927	10268	21195	8
53	78821	89722	89099	10901	10278	21179	7
54	78837	89712	89125	10875	10288	21163	6
55	78853	89703	89151	10849	10298	21147	5
56	78886	89693	89177	10823	10307	21131	4
57	78896	89683	89203	10797	10317	21114	3
58	78902	89673	89229	10771	10327	21098	2
59	78918	89663	89255	10745	10337	21082	1
60	78934	89653	89281	10719	10347	21066	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Cosine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.78934	9.89653	9.89281	10.10719	10.10347	10.21066	60
1	78950	89643	89307	10693	10357	21050	59
2	78967	89633	89333	10667	10367	21033	58
3	78983	89624	89359	10641	10376	21017	57
4	78999	89614	89385	10615	10386	21001	56
5	79015	89604	89411	10589	10396	20985	55
6	79031	89594	89437	10563	10406	20969	54
7	79047	89584	89463	10537	10416	20953	53
8	79063	89574	89489	10511	10426	20937	52
9	79079	89564	89515	10485	10436	20921	51
10	9.79095	9.89554	9.89541	10.10459	10.10446	10.20905	50
11	79111	89544	89567	10433	10456	20889	49
12	79128	89534	89593	10407	10466	20872	48
13	79144	89524	89619	10381	10476	20856	47
14	79160	89514	89645	10355	10486	20840	46
15	79176	89504	89671	10329	10496	20824	45
16	79192	89495	89697	10303	10505	20808	44
17	79208	89485	89723	10277	10515	20792	43
18	79224	89475	89749	10251	10525	20776	42
19	79240	89465	89775	10225	10535	20760	41
20	9.79256	9.89455	9.89801	10.10199	10.10545	10.20744	40
21	79272	89445	89827	10173	10555	20728	39
22	79288	89435	89853	10147	10565	20712	38
23	79304	89425	89879	10121	10575	20696	37
24	79319	89415	89905	10095	10585	20681	36
25	79335	89405	89931	10069	10595	20665	35
26	79351	89395	89957	10043	10605	20649	34
27	79367	89385	89983	10017	10615	20633	33
28	79383	89375	90009	09991	10625	20617	32
29	79399	89364	90035	09965	10636	20601	31
30	9.79415	9.89354	9.90060	10.09939	10.10646	10.20585	30
31	79431	89344	90086	09914	10656	20569	29
32	79447	89334	90112	09888	10666	20553	28
33	79463	89324	90138	09862	10676	20537	27
34	79478	89314	90164	09836	10686	20522	26
35	79494	89304	90190	09810	10696	20506	25
36	79510	89294	90216	09784	10706	20490	24
37	79526	89284	90242	09758	10716	20474	23
38	79542	89274	90268	09732	10726	20458	22
39	79558	89264	90294	09706	10736	20442	21
40	9.79573	9.89254	9.90320	10.09680	10.10746	10.20427	20
41	79589	89244	90346	09654	10756	20411	19
42	79605	89233	90371	09629	10767	20395	18
43	79621	89223	90397	09603	10777	20379	17
44	79636	89213	90423	09577	10787	20364	16
45	79652	89203	90449	09551	10797	20348	15
46	79668	89193	90475	09525	10807	20332	14
47	79684	89183	90501	09499	10817	20316	13
48	79699	89173	90523	09473	10827	20301	12
49	79715	89162	90553	09447	10838	20285	11
50	9.79731	9.89152	9.90578	10.09422	10.10848	10.20269	10
51	79746	89142	90604	09396	10858	20254	9
52	79762	89132	90630	09370	10868	20238	8
53	79778	89122	90656	09344	10878	20222	7
54	79793	89112	90682	09318	10888	20207	6
55	79809	89101	90708	09292	10899	20191	5
56	79825	89091	90734	09266	10909	20175	4
57	79840	89081	90759	09241	10919	20160	3
58	79856	89071	90785	09215	10929	20144	2
59	79872	89060	90811	09189	10949	20128	1
60	79887	89050	90837	09163	10950	20113	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine	Co-sine	Tang.	Co-tang	Secant	Co-sec.	
0	9.79887	9.88450	9.90837	10.09163	10.10550	10.20113	60
1	79903	89040	90863	09137	10960	20097	59
2	79918	89030	90889	09111	10870	20082	58
3	79934	89020	90914	09086	10980	20066	57
4	79950	89009	90940	09060	10991	20050	56
5	79965	88999	90966	09034	11001	20035	55
6	79982	88989	90992	09008	11011	20019	54
7	79996	88978	91018	08982	11022	20004	53
8	80012	88968	91043	08957	11032	19988	52
9	80027	88958	91069	08931	11042	19973	51
10	9.80043	9.88948	9.91095	10.08905	10.11052	10.19957	50
11	80058	88937	91121	08879	11063	19942	49
12	80074	88927	91147	08853	11073	19926	48
13	80089	88917	91172	08828	11083	19911	47
14	80105	88906	91198	08802	11094	19895	46
15	80120	88896	91224	08776	11104	19880	45
16	80136	88886	91250	08750	11114	19864	44
17	80151	88875	91276	08724	11125	19849	43
18	80166	88865	91301	08699	11135	19834	42
19	80182	88855	91327	08673	11145	19818	41
20	9.80197	9.88844	9.91353	10.08647	10.11156	10.19803	40
21	80213	88834	91379	08621	11166	19787	39
22	80228	88824	91404	08596	11176	19772	38
23	80244	88813	91430	08570	11187	19756	37
24	80259	88803	91456	08544	11197	19741	36
25	80274	88793	91482	08518	11207	19726	35
26	80290	88782	91507	08493	11218	19710	34
27	80305	88772	91533	08467	11228	19695	33
28	80320	88761	91559	08441	11239	19680	32
29	80336	88751	91585	08415	11249	19664	31
30	9.80351	9.88741	9.91610	10.08390	10.11259	10.19649	30
31	80366	88730	91636	08364	11270	19634	29
32	80382	88720	91662	08338	11280	19618	28
33	80397	88709	91688	08312	11291	19603	27
34	80412	88699	91713	08287	11301	19588	26
35	80428	88688	91739	08261	11312	19572	25
36	80443	88678	91765	08235	11322	19557	24
37	80458	88668	91791	08209	11332	19542	23
38	80473	88657	91816	08184	11343	19527	22
39	80489	88647	91842	08158	11353	19511	21
40	9.80504	9.88636	9.91868	10.08132	10.11364	10.19496	20
41	80519	88626	91893	08107	11374	19482	19
42	80534	88615	91919	08081	11385	19466	18
43	80550	88605	91945	08055	11395	19450	17
44	80565	88594	91971	08029	11406	19435	16
45	80580	88584	91996	08004	11416	19420	15
46	80595	88573	92022	07978	11427	19405	14
47	80610	88563	92048	07952	11437	19390	13
48	80625	88552	92073	07927	11448	19375	12
49	80641	88542	92099	07901	11458	19359	11
50	9.80656	9.88531	9.92125	10.07875	10.11469	10.19344	10
51	80671	88521	92150	07850	11472	19329	9
52	80686	88510	92176	07824	11490	19314	8
53	80701	88499	92202	07798	11501	19299	7
54	80716	88489	92227	07773	11511	19284	6
55	80731	88478	92253	07747	11522	19269	5
56	80746	88468	92279	07721	11532	19254	4
57	80762	88457	92304	07696	11543	19238	3
58	80777	88447	92330	07670	11553	19223	2
59	80792	88436	92356	07644	11564	19208	1
60	80807	88425	92381	07619	11575	19193	0
	Co-sine	Sine	Co-tang	Tang.	Co-sec.	Secant	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.80807	9.88425	9.92381	10.07619	10.11575	10.19193	60
1	80822	88415	92407	07593	11585	19178	59
2	80837	88404	92433	07567	11596	19163	58
3	80852	88394	92458	07542	11606	19148	57
4	80867	88383	92484	07516	11617	19133	56
5	80882	88372	92510	07490	11628	19118	55
6	80897	88362	92535	07465	11638	19103	54
7	80912	88351	92561	07439	11649	19088	53
8	80927	88340	92587	07413	11660	19073	52
9	80942	88330	92612	07388	11670	19058	51
10	9.80957	9.88319	9.92638	10.07362	10.11681	10.19043	50
11	80972	88308	92663	07337	11692	19028	49
12	80987	88298	92689	07311	11702	19013	48
13	81002	88287	92715	07285	11713	18998	47
14	81017	88276	92740	07260	11724	18983	46
15	81032	88266	92766	07234	11734	18968	45
16	81046	88255	92792	07208	11745	18954	44
17	81061	88244	92817	07183	11756	18939	43
18	81076	88234	92843	07157	11766	18924	42
19	81091	88223	92868	07132	11777	18909	41
20	9.81106	9.88212	9.92894	10.07106	10.11788	10.18894	40
21	81121	88201	92920	07080	11799	18879	39
22	81136	88191	92945	07055	11809	18864	38
23	81151	88189	92971	07029	11820	18849	37
24	81166	88169	92996	07004	11831	18834	36
25	81180	88158	93022	06978	11842	18820	35
26	81195	88148	93048	06952	11852	18805	34
27	81210	88137	93073	06927	11863	18790	33
28	81225	88126	93099	06901	11874	18775	32
29	81240	88115	93124	06876	11885	18760	31
30	9.81254	9.88105	9.93150	10.06850	10.11895	10.18746	30
31	81269	88094	93175	06825	11906	18731	29
32	81284	88083	93201	06799	11917	18716	28
33	81299	88072	93227	06773	11928	18701	27
34	81314	88061	93252	06748	11939	18686	26
35	81328	88050	93278	06722	11949	18672	25
36	81343	88040	93303	06697	11960	18657	24
37	81358	88029	93329	06671	11971	18642	23
38	81372	88018	93354	06646	11982	18628	22
39	81387	88007	93380	06620	11993	18613	21
40	9.81402	9.87996	9.93406	10.06594	10.12004	10.18598	20
41	81417	87985	93431	06569	12015	18583	19
42	81431	87975	93457	06543	12025	18569	18
43	81446	87964	93482	06518	12036	18554	17
44	81461	87953	93508	06492	12047	18539	16
45	81475	87942	93533	06467	12058	18525	15
46	81490	87931	93559	06441	12069	18510	14
47	81505	87920	93584	06416	12080	18495	13
48	81519	87909	93610	06390	12091	18481	12
49	81534	87898	93635	06364	12102	18466	11
50	9.81549	9.87887	9.93661	10.06339	10.12113	10.18451	10
51	81563	87877	93687	06313	12123	18437	9
52	81578	87866	93712	06288	12134	18422	8
53	81592	87855	93738	06262	12145	18408	7
54	81607	87844	93763	06237	12156	18393	6
55	81622	87833	93789	06211	12167	18378	5
56	81636	87822	93814	06186	12178	18364	4
57	81651	87811	93849	06160	12189	18349	3
58	81665	87800	93865	06135	12200	18335	2
59	81680	87789	93891	06109	12211	18320	1
60	81694	87778	93916	06084	12222	18306	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.81694	9.87778	9.93916	10.06084	10.12222	10.18306	60
1	81709	87767	93942	06058	12233	18291	59
2	81723	87756	93967	06033	12244	18277	58
3	81738	87745	93993	06007	12255	18262	57
4	81752	87734	94018	05982	12266	18248	56
5	81767	87723	94044	05956	12277	18233	55
6	81781	87712	94069	05931	12288	18219	54
7	81796	87701	94095	05905	12299	18204	53
8	81810	87690	94120	05880	12310	18190	52
9	81825	87679	94146	05854	12321	18175	51
10	9.81839	9.87668	9.94171	10.05829	10.12332	10.18161	50
11	81854	87657	94197	05803	12343	18146	49
12	81868	87646	94222	05778	12354	18132	48
13	81882	87635	94248	05752	12365	18118	47
14	81897	87624	94273	05727	12376	18103	46
15	81911	87613	94299	05701	12387	18089	45
16	81926	87601	94324	05676	12399	18074	44
17	81940	87590	94350	05650	12410	18060	43
18	81954	87579	94375	05625	12421	18046	42
19	81969	87568	94401	05599	12432	18031	41
20	9.81983	9.87557	9.94426	10.05574	10.12443	10.18017	40
21	81998	87546	94452	05548	12454	18002	39
22	82012	87535	94477	05523	12465	17988	38
23	82026	87524	94503	05497	12476	17974	37
24	82041	87513	94528	05472	12487	17959	36
25	82055	87501	94554	05446	12499	17945	35
26	82069	87490	94579	05421	12510	17931	34
27	82084	87479	94604	05396	12521	17916	33
28	82098	87468	94630	05370	12532	17902	32
29	82112	87457	94655	05345	12543	17388	31
30	9.82126	9.87446	9.94681	10.05319	10.12554	10.17874	30
31	82141	87434	94706	05294	12566	17859	29
32	82155	87423	94732	05268	12577	17845	28
33	82169	87412	94757	05243	12588	17831	27
34	82184	87401	94783	05217	12599	17816	26
35	82198	87390	94808	05192	12610	17802	25
36	82212	87378	94834	05166	12622	17788	24
37	82226	87367	94859	05141	12633	17774	23
38	82240	87356	94884	05116	12644	17760	22
39	82255	87345	94910	05090	12655	17745	21
40	9.82269	9.87334	9.94935	10.05065	10.12666	10.17731	20
41	82283	87322	94961	05039	12678	17717	19
42	82297	87311	94986	05014	12689	17703	18
43	82311	87300	95012	04988	12700	17689	17
44	82326	87288	95037	04963	12711	17674	16
45	82340	87277	95062	04938	12723	17660	15
46	82354	87266	95088	04912	12734	17646	14
47	82368	87255	95113	04887	12745	17632	13
48	82382	87243	95139	04861	12757	17618	12
49	82396	87232	95164	04836	12768	17604	11
50	9.82410	9.87221	9.95190	10.04810	10.12779	10.17590	10
51	82424	87209	95215	04785	12791	17576	9
52	82439	87198	95240	04760	12802	17561	8
53	82453	87187	95266	04734	12813	17547	7
54	82467	87175	95291	04709	12825	17533	6
55	82481	87164	95317	04683	12836	17519	5
56	82495	87153	95342	04658	12847	17505	4
57	82509	87141	95368	04632	12859	17491	3
58	82523	87130	95393	04607	12870	17477	2
59	82537	87119	95418	04582	12881	17463	1
60	82551	87107	95444	04556	12893	17449	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.78934	9.89653	9.89281	10.10719	10.10347	10.21066	60
1	78950	89643	89307	10693	10357	21050	59
2	78967	89633	89333	10667	10367	21033	58
3	78983	89624	89359	10641	10376	21017	57
4	78999	89614	89385	10615	10386	21001	56
5	79015	89604	89411	10589	10396	20985	55
6	79031	89594	89437	10563	10406	20969	54
7	79047	89584	89463	10537	10416	20953	5 3
8	79063	89574	89489	10511	10426	20937	52
9	79079	89564	89515	10485	10436	20921	51
10	9.79095	9.89554	9.89541	10.10459	10.10446	10.20905	50
11	79111	89544	89567	10433	10456	20889	49
12	79128	89534	89593	10407	10466	20872	48
13	79144	89524	89619	10381	10476	20856	47
14	79160	89514	89645	10355	10486	20840	46
15	79176	89504	89671	10329	10496	20824	45
16	79192	89495	89697	10303	10505	20808	44
17	79208	89485	89723	10277	10515	20792	43
18	79224	89475	89749	10251	10525	20776	42
19	79240	89465	89775	10225	10535	20760	41
20	9.79256	9.89455	9.89801	10.10199	10.10545	10.20744	40
21	79272	89445	89827	10173	10555	20728	39
22	79288	89435	89853	10147	10565	20712	38
23	79304	89425	89879	10121	10575	20696	37
24	79319	89415	89905	10095	10585	20681	36
25	79335	89405	89931	10069	10595	20665	35
26	79351	89395	89957	10043	10605	20649	34
27	79367	89385	89983	10017	10615	20633	33
28	79383	89375	90009	09991	10625	20617	32
29	79399	89364	90035	09965	10636	20601	31
30	9.79415	9.89354	9.90060	10.09939	10.10646	10.20585	30
31	79431	89344	90086	09914	10656	20569	29
32	79447	89334	90112	09888	10666	20553	28
33	79463	89324	90138	09862	10676	20537	27
34	79478	89314	90164	09836	10686	20522	26
35	79494	89304	90190	09810	10696	20506	25
36	79510	89294	90216	09784	10706	20490	24
37	79526	89284	90242	09758	10716	20474	23
38	79542	89274	90268	09732	10726	20458	22
39	79558	89264	90294	09706	10736	20442	21
40	9.79573	9.89254	9.90320	10.09680	10.10746	10.20427	20
41	79589	89244	90346	09654	10756	20411	19
42	79605	89233	90371	09629	10767	20395	18
43	79621	89223	90397	09603	10777	20379	17
44	79636	89213	90423	09577	10787	20364	16
45	79652	89203	90449	09551	10797	20348	15
46	79668	89193	90475	09525	10807	20332	14
47	79684	89183	90501	09499	10817	20316	13
48	79699	89173	90523	09473	10827	20301	12
49	79715	89162	90553	09447	10838	20285	11
50	9.79731	9.89152	9.90578	10.09422	10.10848	10.20269	10
51	79746	89142	90604	09396	10858	20254	9
52	79762	89132	90630	09370	10868	20238	8
53	79778	89122	90656	09344	10878	20222	7
54	79793	89112	90682	09318	10888	20207	6
55	79809	89101	90708	09292	10899	20191	5
56	79825	89091	90734	09266	10909	20175	4
57	79840	89081	90759	09241	10919	20160	3
58	79856	89071	90785	09215	10929	20144	2
59	79872	89060	90811	09189	10949	20128	1
60	79887	89050	90837	09163	10950	20113	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.79887	9.89050	9.90837	10.09163	10.10950	10.20113	60
1	79903	89040	90863	09137	10960	20097	59
2	79918	89030	90889	09111	10970	20082	58
3	79934	89020	90914	09086	10980	20066	57
4	79950	89009	90940	09060	10991	20050	56
5	79965	88999	90966	09034	11001	20035	55
6	79982	88989	90992	09008	11011	20019	54
7	79996	88978	91018	08982	11022	20004	53
8	80012	88968	91043	08957	11032	19988	52
9	80027	88958	91069	08931	11042	19973	51
10	9.80043	9.88948	9.91095	10.08905	10.11052	10.19957	50
11	80058	88937	91121	08879	11063	19942	49
12	80074	88927	91147	08853	11073	19926	48
13	80089	88917	91172	08828	11083	19911	47
14	80105	88906	91198	08802	11094	19895	46
15	80120	88896	91224	08776	11104	19880	45
16	80136	88886	91250	08750	11114	19864	44
17	80151	88875	91276	08724	11125	19849	43
18	80166	88865	91301	08699	11135	19834	42
19	80182	88855	91327	08673	11145	19818	41
20	9.80197	9.88844	9.91353	10.08647	10.11156	10.19803	40
21	80213	88834	91379	08621	11166	19787	39
22	80228	88824	91404	08596	11176	19772	38
23	80244	88813	91430	08570	11187	19756	37
24	80259	88803	91456	08544	11197	19741	36
25	80274	88793	91482	08518	11207	19726	35
26	80290	88782	91507	08493	11218	19710	34
27	80305	88772	91533	08467	11228	19695	33
28	80320	88761	91559	08441	11239	19680	32
29	80336	88751	91585	08415	11249	19664	31
30	9.80351	9.88741	9.91610	10.08390	10.11259	10.19649	30
31	80366	88730	91636	08364	11270	19634	29
32	80382	88720	91662	08338	11280	19618	28
33	80397	88709	91688	08312	11291	19603	27
34	80412	88699	91713	08287	11301	19588	26
35	80428	88688	91739	08261	11312	19572	25
36	80443	88678	91765	08235	11322	19557	24
37	80458	88668	91791	08209	11332	19542	23
38	80473	88657	91816	08184	11343	19527	22
39	80489	88647	91842	08158	11353	19511	21
40	9.80504	9.88636	9.91868	10.08132	10.11364	10.19496	20
41	80519	88626	91893	08107	11374	19482	19
42	80534	88615	91919	08081	11385	19466	18
43	80550	88605	91945	08055	11395	19450	17
44	80565	88594	91971	08029	11406	19435	16
45	80580	88584	91996	08004	11416	19420	15
46	80595	88573	92022	07978	11427	19405	14
47	80610	88563	92048	07952	11437	19390	13
48	80625	88552	92073	07927	11448	19375	12
49	80641	88542	92099	07901	11458	19359	11
50	9.80656	9.88531	9.92125	10.07875	10.11469	10.19344	10
51	80671	88521	92150	07850	11472	19329	9
52	80686	88510	92176	07824	11490	19314	8
53	80701	88499	92202	07798	11501	19299	7
54	80716	88489	92227	07773	11511	19284	6
55	80731	88478	92253	07747	11522	19269	5
56	80746	88468	92279	07721	11532	19254	4
57	80762	88457	92304	07696	11543	19238	3
58	80777	88447	92330	07670	11553	19223	2
59	80792	88436	92356	07644	11564	19208	1
60	80807	88425	92381	07619	11575	19193	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

M.	Sine.	Co-sine.	Tang.	Co-tang.	Secant.	Co-sec.	
0	9.84177	9.85693	9.98484	10.01516	10.14307	10.15823	60
1	84190	85681	98509	01491	14319	15810	59
2	84203	85669	98534	01466	14331	15797	58
3	84216	85657	98560	01440	14343	15784	57
4	84229	85645	98585	01415	14355	15771	56
5	84242	85632	98610	01390	14368	15758	55
6	84255	85620	98635	01365	14380	15745	54
7	84269	85608	98661	01339	14392	15731	53
8	84282	85596	98686	01314	14404	15718	52
9	84295	85583	98711	01289	14417	15705	51
10	9.84308	9.85571	9.98737	10.01263	10.14429	10.15692	50
11	84321	85559	98762	01238	14441	15679	49
12	84334	85546	98787	01213	14454	15666	48
13	84347	85534	98812	01188	14466	15653	47
14	84360	85522	98838	01162	14478	15640	46
15	84372	85510	98863	01137	14490	15627	45
16	84385	85497	98888	01112	14503	15614	44
17	84398	85485	98913	01087	14515	15602	43
18	84411	85473	98939	01061	14527	15589	42
19	84424	85460	98964	01036	14540	15576	41
20	9.84437	9.85448	9.98989	10.01011	10.14552	10.15563	40
21	84450	85436	99014	00985	14564	15550	39
22	84463	85423	99040	00960	14577	15537	38
23	84476	85411	99065	00935	14589	15524	37
24	84489	85399	99090	00910	14601	15511	36
25	84502	85386	99116	00884	14614	15498	35
26	84515	85374	99141	00859	14626	15485	34
27	84528	85361	99166	00834	14639	15472	33
28	84540	85349	99191	00809	14651	15460	32
29	84553	85337	99217	00783	14663	15447	31
30	9.84566	9.85324	9.9924	10.00758	10.14676	10.15434	30
31	84579	85312	99267	00733	14688	15421	29
32	84592	85299	99293	00707	14701	15408	28
33	84605	85287	99318	00682	14713	15395	27
34	84618	85274	99343	00657	14726	15382	26
35	84630	85262	99368	00632	14738	15370	25
36	84643	85250	99394	00606	14750	15357	24
37	84656	85237	99419	00581	14763	15344	23
38	84669	85225	99444	00556	14775	15331	22
39	84682	85212	99469	00531	14788	15318	21
40	9.84694	9.85200	9.99495	10.00505	10.14800	10.15306	20
41	84707	85187	99520	00480	14813	15293	19
42	84720	85175	99545	00455	14825	15280	18
43	84733	85162	99570	00430	14838	15267	17
44	84745	85150	99596	00404	14850	15255	16
45	84758	85137	99621	00379	14863	15242	15
46	84771	85125	99646	00354	14875	15229	14
47	84784	85112	99672	00328	14888	15216	13
48	84796	85100	99697	00303	14900	15204	12
49	84809	85087	99722	00278	14913	15191	11
50	9.84822	9.85074	9.99747	10.00253	10.14926	10.15178	10
51	84834	85062	99773	00227	14938	15166	9
52	84847	85049	99798	00202	14951	15153	8
53	84860	85037	99823	00177	14963	15140	7
54	84873	85024	99848	00152	14976	15127	6
55	84885	85012	99874	00126	14988	15115	5
56	84898	84999	99899	00101	15001	15102	4
57	84911	84986	99924	00076	15014	15089	3
58	84923	84974	99949	00051	15026	15077	2
59	84936	84961	99975	00025	15039	15064	1
60	84948	84948	10.00000	10.00000	15052	15051	0
	Co-sine.	Sine.	Co-tang.	Tang.	Co-sec.	Secant.	M.

45 Degrees.